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BY EMINENT AMERICAN AND ENGLISH AUTHORITIES

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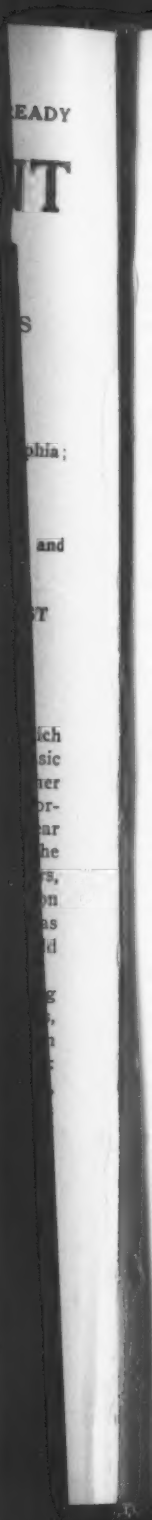

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THE

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FEBRUARY, 1911.

ORIGINAL ARTICLES.

THE MEDICINAL TREATMENT OF DIABETES MELLITUS.

By F. Forchheimer, M.D.,

PROFESSOR OF MEDICINE IN THE OHIO-MIAMI MEDICAL COLLEGE, UNIVERSITY OF CINCINNATI, CINCINNATI, OHIO.

It may be freely admitted that the progress in the treatment of diabetes mellitus has been due to the more or less scientific appreciation of dietetics, which leads to the reduction or removal of the sugar in the urine. Although there is no scientific explanation why certain carbohydrates, such as are found in oatmeal, in potatoes, even in glucose itself, may not only do no harm, but do good, yet the dietetic treatment for the present, and possibly for some time to come, is the one which should be instituted in every case whenever possible. At all events, and this always is the essential in every therapeutic procedure, in our present state of knowledge, it leads to the best results in the greatest number of cases. Moreover, most experts are united in saying "that without suitable diet a favorable influence upon the disease is excluded" (Naunyn). But when we come to the final analysis of the effects of this mode of treatment, they are only of a symptomatic nature—followed, it is true, in individual cases by more or less lasting improvement. It may also be admitted that in rare cases this treatment leads to a cure of the disease, as occurs in other diseases in which the cause of the disease is removed by removing the symptoms produced by it. That the prevention of certain not infrequently fatal complications may be accomplished by dietetic treatment is an established fact.

The question whether all this can be accomplished in any other way should also seriously engage our attention. Indeed, there comes up, first, a question of much greater importance: Is there any-

thing by which the cause of the disease can be removed? In order to do this, and as dieting is only rarely causal, some other remedy should be found. The problem, then, is first to find a causal procedure; and second, if this cannot be done, some symptomatic treatment which can be applied in every case with benefit. The dietetic treatment fails for two reasons: First, because it is of little or no value, that is, the urine cannot be made sugar-free by it, or its sugar cannot be sufficiently reduced; and second, because it is impossible to have dieting carried out by the patient. Notwithstanding all efforts to impress upon him the absolute necessity of dieting, the advice is not heeded in a certain percentage of private patients (15 to 20 per cent. in my experience). Moreover, there is a large number of patients who cannot, for external reasons, pursue this treatment. In these circumstances it is natural that medicine should be tried. It is from the two kinds of patients just described that my conclusions are drawn.

Before the present era medicine was prescribed in every case of diabetes mellitus; the medical pendulum then swung to the other extreme, and now medicine is rarely given. In most instances the drugs were prescribed in a purely empirical way—recommended by some great clinical master; they were employed by those within the circle of his influence. At other times, remedies were applied on account of some physiological discovery, as the employment of arsenic, which prevents the development of glycosuria when Claude Bernard's piqure is done. More frequently, however, some remedy was given which gave symptomatic relief, more or less temporary, and, in its turn, was discarded when some newer drug was recommended. Some idea of the number of drugs recommended can be obtained from the statement that in the fifth edition of the *National Dispensatory* (1894) forty-two remedies are given, to which there may be added forty-five more up to the present time, without making the list a complete one. It is not astounding, therefore, that skepticism as to the value of medicinal treatment controls the present therapeutic situation. So much so is this the case that Stadelmann claims that no medicine does good in diabetes mellitus. This has not been the case in my experience, as will be shown later.

The action of drugs may be a causal one, as has been intimated before, since the general condition of the patient or the disease which is at the bottom of the diabetes (the liver, circulatory apparatus, the nervous system) may be favorably affected: this from Naunyn,[1] who says that, opium excepted, he considers the internal remedies which have been recommended are "variable, unreliable, or ineffectual." Notwithstanding the latter statement, which especially applies to antidiabetica, there is a large field open for causal treatment—that of arteriosclerosis, the cirrhosis of the liver, including

[1] Der Diabetes Mellitus, 1906, p. 434.

the liver in chronic cholangitis, from whatever cause, and chronic myocardial insufficiency.

Since von Mering and Minkowski[2] established a relation between the pancreas and diabetes mellitus, pancreatic preparations have been prescribed. Given with all precaution, these preparations have failed to produce any effects in the cases in which I have tried them. The same preparations which had been tested by artificial digestion and followed by good results when given for digestive troubles, failed entirely in diabetes mellitus. This is readily explained by the fact that pancreatic failure is frequently not the primary cause of the disease, but the expression of faulty internal secretion, involving, as we know, at least three glands, and possibly more.

Funck[3] has again called attention to the condition of the gastro-intestinal tract for causal treatment. He has reported six cases which were treated by considering gastro-intestinal disease as the cause of the diabetes. The diet prescribed was that indicated for the alimentary trouble, and in the individual case carbohydrate metabolism in its relation to diabetes was entirely disregarded. By this mode of treatment his patients were cured in the sense that they could be put upon a diet of 3000 calories for three days, largely consisting of carbohydrates, and remain sugar-free. Sawyer, of Cleveland, has for quite a number of years employed lavage of the stomach and appropriate diet. He reported[4] 19 cases in 1905, in all of which amelioration of symptoms followed lavage of the stomach, and in some a clinical cure. He states that "the most striking influence has been observed on the polyuria and thirst." Although the percentage of sugar may not be reduced, the diminution in the quantity of urine is followed by a diminished loss of sugar and, therefore, a corresponding gain to the patient. Strübe has done the same.

Diseases of the nervous system should also be considered for causal therapy; a glance at the list of nervous diseases which are said to produce diabetes mellitus will show how much can be expected from causal treatment under these circumstances. In the brain there are syphilis (*vide infra*), apoplexy, acute brain softening, paresis, injuries of various kinds; in the spinal cord, tumors, myelitis, multiple sclerosis, locomotor ataxia, various lesions in the peripheral and the sympathetic nerves, and the various neuroses. Syphilis occurs very often with diabetes mellitus, and it is accused of producing this disease either by a local lesion or in some intangible manner, as it occurs in so many other diseases—all of which is by way of being cleared up at the present day. At the time of writing, and purely as the result of clinical experience, it must be confessed that the ordinary antisyphilitic treatment does not have much effect upon

[2] Archiv f. exper. Path. u. Pharm., 1907, xxvi.

[3] Münch. med. Woch., 1910, p. 1224. [4] Trans. Assoc. Amer. Phys., 1905, xx, 446.

diabetes mellitus. In my whole experience I have not seen a single case in which any therapeutic effect was produced upon diabetes mellitus by mercury or iodides, so that my indication for antisyphilitic treatment in these cases is the syphilis and not the diabetes. Whether the new modes of treatment, especially with Ehrlich's dioxydiamido-arsenobenzol, will give us better results remains to be seen. Finally, in a large number of cases there can be no causal therapy, as no cause can be found during life and frequently no evidence of disease upon autopsy. It will be seen that at the present time the causal treatment of this disease offers us comparatively little. The reasons for this are many: We have been too much engrossed with the chemical aspect of the subject; physiology is just beginning to work out the relation of the various organs engaged in the production of dextrose. Moreover, cause and effect have been confused, because we know so little of the pathological physiology of this disease.

In by far the greatest number of cases, including dietetic treatment, as such, it is necessary to have recourse to symptomatic treatment, the results of which are measured by the amount of urine passed, its dextrose, acetones, and ammonia, by the time in which the urine may be made normal, and by the general condition of the patient. Dietetic treatment of diabetes mellitus produces increased carbohydrate tolerance; medicinal treatment, except in two instances, does not do this.

First among the medicines used is opium, introduced by Dobson in 1774 (von Mering), and now the only drug which is accepted by all writers on the subject of diabetes mellitus as doing good. Not any one of its alkaloids acts as beneficially as does the whole drug; whether Sahli's pantopon will do this remains to be seen. The effects produced by this drug in increasing doses are as follows: the quantity of urine becomes less; the sugar diminishes, notwithstanding the diet remains unchanged; thirst and hunger are lessened; and the patient may gain in weight. The objections to the use of this drug are: (1) That even while it is being taken its beneficial effects may disappear; (2) that sugar tolerance is not established by it; and (3) if discontinued, and then again prescribed it may or may not be followed by good results. It is administered as opium itself, of which 0.03 gram is given three times daily, increasing gradually to 0.5 gram for from one to three weeks. Naunyn states that in cases in which the quantity of urine is very great the dose may have to be increased to as much as 2 to 3 grams in a day. It seems that those cases are most benefited in which there is a nervous origin of the disease, so that, in so far as this may be the case, it may be looked upon as causal treatment. But I hasten to say that this is very rarely the case. The objections to opium are many; giving it to a patient for three weeks may be followed by the opium habit. I have seen this in two diabetic physicians. There are many human beings who cannot take opium in any form, and, after all, its

beneficial effects are limited. So that, as a rule, it should not be prescribed in every case, but only in exceptional instances, either in the rare nervous cases or when everything else has failed. In one of the physicians mentioned after the habit had been removed, the patient finally began to comprehend how necessary it was to follow dietary directions, and he continues as a mild diabetic, to follow his vocation eleven years after the outset of the disease. Von Mering[5] uses the drug when he goes from a restricted to a severe dietetic régime, as it reduces hunger and the change is less felt. I have never found it necessary to do this, and would hesitate to follow this indication. Moreover, for reduction of nervous symptoms, it will be found that the bromides or antipyrin will take the place of opium in the great majority of cases.

For ordinary cases I prefer arsenic, and my experience has been the greatest with it. It should be given as liquor potassii arsenitis, in ascending doses, until mild toxic effects are produced; then the dosage should be gradually reduced. How it acts is difficult to say; it is known that paralysis of the bloodvessels of the splanchnic area prevents glycosuria; this follows toxic doses of arsenic; a congestion of this area also follows the use of smaller doses. However this may be, in order to get the best results from arsenic, mild toxic effects must be produced. It is probable that the neglect of this has caused disappointments in its effects, and at least the German authors ascribe no results as following its administration. The following case is one which illustrates its action:

A girl, aged twenty years; the father and mother are diabetics; she came under observation November 30, 1901. The following condition was present, and the following course ensued:

November 30, 1901. Sugar, 8 per cent.; quantity of urine, 3000 c.c.; acetone, a large quantity.

December 6. Sugar, 3 per cent.; quantity of urine, 2500 c.c.; acetone, plus.

She has not followed directions, which was the case before when under treatment. Although the sugar was reduced, she did not hesitate to admit that she was not going to diet strictly and that the reduction in sugar was due to a little care in diet. I then prescribed Fowler's solution and continued it, with the promise that she would be truthful as to indulgences in taking sweets. The quantity of urine was no longer measured, for obvious reasons.

December 10. Sugar, 2.5 per cent.; acetone, plus.

December 14. Sugar, 1.66 per cent.; acetone, minus.

December 30. Sugar, 1.66 per cent.; acetone, minus.

January 7, 1902. Sugar, 1.66 per cent.

January 15. Sugar, 1 per cent.; arsenic discontinued.

January 30. Sugar, 3.25 per cent.; acetone, plus; arsenic again given and pushed.

[5] Von Penzoldt's Handbuch d. spec. Ther. d. inneren Krankh., ii, 90.

February 3. Sugar, 2.5 per cent.
February 17. Sugar, 3 per cent.
March 3. Sugar, 1.5 per cent.
March 13 Sugar, traces; arsenic discontinued.
March 17. Sugar, 1.33 per cent.

She was then taken to Germany, where she was put under the charge of several authorities upon diabetes mellitus. She was twice put into a sanitarium for antidiabetic treatment, and also took the cure in Carlsbad. From the written reports which were brought home she was never made sugar-free. Furthermore, the sugar percentages were never as low as they were when she was under the influence of arsenic, as noted before. On August 14, 1902, she again came under my observation, with 5.5 per cent., and large quantities of acetone.

August 18, 1902. Sugar, 6 per cent.; acetone, plus.
August 22. Sugar, 5.5 per cent.; acetone, plus.
August 26. Sugar, 6 per cent.; acetone, plus.

The cause of this complete failure of arsenic, which does not, as a rule, occur after it has been given for ten to twelve days, required investigation, and after much questioning it finally transpired that the young lady had engaged herself to be married. She had not had time to take her medicine, indeed, paid no attention to herself in any way. She consented to promise to do better. But she presented herself very rarely after this. When she did, the sugar was not less than 4 per cent. The last record is 8 per cent. sugar, acetone in enormous quantity. Diabetic coma developed, and death ensued December 10, 1902.

This patient, aged twenty years, with hereditary predisposition from both parents, passing large quantities of urine, which contained large quantities of sugar and acetone, and who never could be made absolutely sugar-free, presents the severest type of diabetes mellitus. The arsenic always caused reduction of the sugar.

This drug is especially indicated in the severe cases, but it should always be combined with diet. It may also be given for general indications, and it is very valuable in neurotic, debilitated subjects. Its beneficial effects here certainly contradict the statement of von Mering to the effect that "everything which impairs the appetite reduces the glycosuria." This drug does not increase sugar tolerance, and its effects gradually disappear when it is discontinued; unlike opium, never during its administration. Furthermore, in all of the patients I have treated, repeated courses have not lost their effect upon the glycosuria and diminution of acetone bodies.

The next two remedies to be mentioned are especially valuable in such patients in whom diet regulation is impossible. In another place[6] I have stated how one of my medical friends, Dr. S. Stark,

[6] The Prophylaxis and Treatment of Internal Diseases.

of Cincinnati, found that in a diabetic who had pyelitis, hexamethylenamine reduced the glycosuria. At the present time I have employed it for five years, and given it in 5-grain doses three or four times a day, which has been, in one instance, continually taken for four months without any bad effects. The following case will show its value:

A merchant, aged fifty years, has had diabetes for several years. He had had no results from treatment. The history was otherwise negative. He presented himself in June, 1908. The quantity of urine was 3000 c.c.; sugar, 2 per cent.; no acetone bodies. He was made sugar-free by von Noorden's diet. The sugar tolerance was calculated and an appropriate diet prescribed. June 2, 1908, quantity, 2000 c.c.; sugar, 1 per cent. He went to Carlsbad; came back in the autumn sugar-free and the tolerance much increased. Since leaving Carlsbad he has not dieted; in fact, he has made up his mind not to diet again. In March, 1909, he again presented himself: quantity, 2500 c.c.; sugar, 2 per cent.; no acetone; 0.30 gram of hexamethylenamine thrice daily was prescribed, and he remained practically free from sugar until October 1, 1909. Then again sugar (2 per cent.) was found, and increased quantity of urine. The sugar was reduced to 0.9 per cent. by belladonna. After two months, his sugar being kept down, he ceased to send his urine and passed from observation—he was tired of the restraint of doing anything for himself. On February 26, 1910, he again presented himself, having been to Carlsbad during the previous summer, and again suffering from his self-indulgence. The quantity was 3000 c.c.; the sugar, 4.5 per cent.; no diacetic acid. He cannot be made sugar free by diet, about 0.3 per cent. remaining. This again disappeared under hexamethylenamine by March 1, 1910. A third Carlsbad cure did not produce the usual effects. Dissatisfied with Carlsbad and with his doctor, he is treating himself.

With hexamethylenamine, glycosuria is improved and tolerance is increased. I would not recommend it for severe cases without proper diet. It is difficult to say how it does produce the results which are noted here. It has always been claimed that hexamethylenamine is excreted by the kidneys, being decomposed there into ammonia and formaldehyde. Latterly some doubt has arisen in regard to this, but all agree that when this drug is administered, formaldehyde is found in the urine. From clinical experience we are justified in believing, at least until the contrary has been proved, that the same chemical change goes on in other places in the body. If this is the case, and formaldehyde is found in the blood, von Behring's statement, that formaldehyde is a complement saver, as he has shown for milk, might be considered as explaining its action in diabetes. The subject of the renal origin of diabetes can only be mentioned here; if it exists, and there is much evidence in its favor, the special value of hexamethylenamine, particularly when there is pyelitis, is of great importance.

Belladonna, which was condemned as useless by Frerichs in 1884, has again been recommended by Rudisch,[7] and in such a convincing way that I have put a number of my patients upon this treatment. He recommends atropine methylbromide, beginning in adults with $\frac{2}{1\,5}$ grain, three times daily, and increasing by adding $\frac{1}{1\,5}$ grain until $\frac{8}{1\,5}$ grain is given at one dose. He claims that this preparation is tolerated better than the ordinary preparations and is less toxic. Atropine sulphate, according to him, should be begun with $\frac{1}{1\,5\,0}$ grain, three times daily, and gradually increased to $\frac{1}{2\,0}$ grain.

In as far as the medication itself is concerned, my results were the same whether I gave atropine methylbromide, atropine sulphate, or belladonna itself. It seemed to me that the tincture of belladonna was better tolerated than the other preparations. It is necessary, however, to get a reliable preparation, which has been difficult in my experience; and this, no doubt, is the reason why therapeutic failures occur so frequently when this drug is prescribed in this form. The results which I have obtained, aside from what has been stated, agree fully with those of Rudisch. In a large number of cases glycosuria, and with it acetone bodies, have diminished or disappeared and carbohydrate tolerance was increased. Indeed, some of the patients were not dieting when taking this remedy, but when it was discontinued the sugar did not reappear for some time. In several severe cases it did no good. It seems perfectly adapted to milder cases, so that in one instance, without diet, there has been absence of sugar for over a year. In one case of diabetes in a child the disease ran its usual course, notwithstanding a strict adherence to Rudisch's directions as to diet and atropine methylbromide.

The views regarding the effects of mineral waters on this disease, and I refer especially to Carlsbad and Vichy, differ much. Most excellent observers state that the effects are negative (von Mehring); others hold the view (von Naunyn) that they are beneficial only in mild cases; and the fewest number of authors state that they are of value in every case. The latter view can be dismissed without discussion. The former view must be considered. It is based largely upon the theoretical assumption and experimental experience that alkalies have no effect upon dextrose elimination when given in the form in which they appear in the mineral waters before mentioned. It does not matter whether Glauber's salt with or without other alkalies, Carlsbad salts (artificial or "natural"), or bottled Carlsbad water has been used in coming to this conclusion; the results of such experiments are absolutely inconclusive in regard to the effects of these waters when taken as they flow from the spring. Physical chemistry has shown that all the other analyses which we have considered as final are imperfect in so far as they prevent a conception of the inner ionic structure of mineral waters, so that all the experiments

[7] Medical Record, June 26, 1909.

made before this was discovered are inconclusive and without value. Among those who claim that Carlsbad is beneficial, there are those who attribute the good effects to change of scene, rest, change of surroundings, and diet. The benefits of the first three in diabetes will be admitted by all. So far as the diet is concerned, until within the last few years there was not enough stress laid upon it in Carlsbad. In 1906 Naunyn wrote: "It is certain that the success of the cure at these various places does not depend upon a specially strict dietetic treatment; according to my experience, one cannot count with certainty upon a strict dietetic treatment." That this is true there is no doubt, but, fortunately, things have changed somewhat in Carlsbad, so that the patients can be, and are, dieted there as strictly as anywhere. Experience teaches us that good results are obtained there which are not due to diet and external conditions; therefore, it would seem that the waters do play a role in the production of these results. What has been said of Carlsbad is also true of Neuenahr and Vichy. In a few places in our country rational dieting is also being introduced.

In the new conditions which obtain in Carlsbad both mild and severe forms are improved by treatment. Naturally, the mild forms are improved most, and while the older statements in regard to the inefficiency of these cures may have been true, at present even severe forms may improve there. Being of the severe form, these patients do not come home sugar free, but with sugar reduced and their general health much improved. In the milder cases sugar disappears, tolerance is enormously increased, and the general condition is improved. In a number of cases the sugar tolerance persists for as long as six months, notwithstanding the fact that these patients do not diet. The mildest cases, when their diet is arranged for their sugar tolerance, may remain sugar free for years. It is true that this does occur without Carlsbad with the ordinary diabetic treatment, but it is my experience that it does not occur so frequently. The case reported before with hexamethylenamine treatment illustrates this very well.

For treatment, only one complication, diabetic coma, need be considered here, as all the others either disappear when the glycosuria is controlled or are treated as they would be in other circumstances. At present, diabetic coma is looked upon as an acidosis, due to the presence of large quantities of oxybutyric and, possibly, diacetic acid in the blood—the result of which is that first the ordinary alkalies are bound to them for elimination by the urine, and when these are no longer sufficient, ammonia is formed from ultimate metabolic changes of albumin which ordinarily leads only to urea. This ammonia combines with the harmful acids and is found in the urine. Indeed, the amount of ammonia found in the urine may be looked upon as a quantitative estimate of the acidosis. From this it would seem that the solution of this therapeutic problem

should be easy; add alkalies to control the acids. As a matter of fact, this is what has been done. Sodium carbonate or bicarbonate have been administered by the mouth, the rectum, and intravenously in large quantities, varying from 15 to 84 grams in twenty-four hours. And yet, simple as is the ratiocination, this treatment has remained singularly ineffective. I have never seen a patient recover from true diabetic coma when it has been thoroughly established. I have seen diabetics recover from coma due to other causes, as has everyone who has seen many diabetics, and this line of demarcation between coma in diabetes and diabetic coma should be carefully drawn in the reports of cases. Moreover, even when one neutralizes the urine, the coma being developed, the patient does not recover, which shows that eventually this whole process is something more than a simple question of acidity and alkalinity. The urine, being more alkaline, shows that in all probability the blood is also alkaline. But we have no evidence that the tissues are favorably affected by this alkalinity or that the alkalinity is of the proper nature. To overcome this, it might be well to try other ions beside those of sodium when diabetic coma is well developed. But even this seems hopeless when we consider that tissue changes go on which probably are irremediable, because of the time required to remove them.

On the other hand, when the first symptoms of coma are recognized, the therapeutic results are fairly good with sodium treatment. The indications for the administration of sodium bicarbonate are the occurrence of large quantities of acetone or ammonia in the urine. This should always be followed by the internal administration of sodium bicarbonate in quantities sufficient to make the urine neutral or slightly alkaline; when the remedy is withdrawn and the previous urinary condition again develops, the indication should again be carried out. In addition, the patient should be put upon the proper diet. For practical purposes, it may be accepted that fats and albumin principally produce acetone bodies and acidosis; therefore these patients should be put upon carbohydrates, irrespective of the degree of glycosuria, as the prevention of the full development of diabetic coma is, for the time being, the paramount indication. Large quantities of oatmeal or potato may be given, but according to Naunyn's experience, which I can verify from personal experience, milk in sufficient quantity as an exclusive food seems to be the best that can be done dietetically. I cannot refrain from again stating the fact that in treating diabetics for sugar tolerance great care must be taken not to produce coma. This does occur, and it is not a pleasant experience. There are two ways to avoid it: the first is by taking into consideration the results of urine analysis, as stated before, the second is to give patients sodium bicarbonate during the testing period, as was first recommended by von Noorden.

THE DIETETIC TREATMENT OF DIABETES MELLITUS.

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To one who has devoted much attention to the study and treatment of diabetes the difficulties that beset the general practitioner in an endeavor to arrange diets for these cases and to make the requisite analyses within the time available seems almost insurmountable. It is the object of this paper to present in a simple way such routine procedures as a clear understanding of the indidual case demands and a scheme of diet tables which permits of that adaptation of food to the peculiarities of the individual without which no degree of success can be expected. The dietetic treatment of diabetes demands the same attention to detail that is required in the modification of milk for infant feeding, and on this account minutiæ will be set forth in this paper which to many will appear unnecessary.

Before proceeding further it is desirable to say a word regarding the detection of sugar in urine. When large amounts of sugar are present in the urine there is no likelihood of other substances being mistaken for it; but when less than 1 per cent. occurs this is not the case if Fehling's solution be employed, as it now generally is. I have seen three persons who had been told that they suffered from diabetes and who excreted no sugar in the urine, the reducing body being glycuronic acid. It should be remembered that reducing bodies other than glucose react with alkaline copper solutions; of these uric acid, glycuronic acid, and sugars other than glucose may occur in the urine in amounts large enough to lead to confusion. A urine which reduces Fehling's solution before, but not after fermentation, in all probability contains glucose. Occasionally one finds that the urine passed at one time of day has a little glucose in it, while none may be found in other samples from the twenty-four hour specimen. This is rather characteristic of a type of gouty individual; and the sugar excretion in such cases will be found to follow a meal when it is the man's habit to eat largely of sweets. For example, one patient had sugar in the urine passed during the night and it was found on inquiry that he usually ate considerable candy after dinner. These cases are not to be regarded as diabetics, although some of them doubtless become so. They should be cautioned and the total amount of food diminished, since they are always over weight.

In advising a diet for a diabetic, one has the following conditions to consider: (1) A diminished ability on the part of the diseased organism to assimilate carbohydrates; (2) a metabolism perverted in such a manner that fatty acids are no longer burned in a normal

manner or to their normal end-products and in consequence of this acid bodies are developed which are toxic; and (3) a diminution of carbohydrate food to meet condition (1) predisposes and increases in degree condition (2). From these considerations it is evident that whatever is done in the way of diminishing the carbohydrate ingest must be effected with caution and with attention directed as much to the degree of acidosis as to the sugar output. On this account it is always advisable to change from a general diet containing a normal amount of carbohydrate to one that is poor in starch gradually; and this is especially the case with young patients. This aim is most easily effected by having some routine diet containing a definite and known amount of carbohydrate which may be gradually reduced as one proceeds with the case in hand. It is an advantage to begin with such a diet in each case because the differences of "reaction" give clues as to what may be expected from various therapeutic and dietetic procedures. The following is the diet I employ as a means of finding the type to which an individual case belongs:

"TEST" DIET.[1]

Breakfast:
3 eggs with 25 grams of bacon.
3 biscuits (Huntly and Palmer breakfast[2]) with 20 grams of butter.
1 cup of strong coffee,[3] 25 c.c. of cream.

Dinner:
1 cup of bouillon.
100 grams of beefsteak or roast beef (weighed cooked).
Boiled cabbage or cauliflower with butter sauce ad libitum; lettuce with oil and vinegar.
25 grams of cream cheese.
Coffee jelly with 25 c.c. of cream.
3 biscuits with 20 grams of butter.

4 to 5 P.M.:
Coffee or tea with 25 c.c. of cream.
1 biscuit; 10 grams of butter.

Supper:
100 grams of fish (weighed cooked).
2 eggs.
Asparagus as salad or hot (with butter sauce).
3 biscuits; 20 grams of butter.
1 dozen almonds.

This diet represents approximately 125 grams of protein and 100 grams of carbohydrate, and is equivalent to 3200 calories. It would be more than adequate were it not for the sugar loss through the urine, which for the time must be made good to prevent loss of weight.

[1] Without bread this diet is practically free of sugar and is the "C. F." (carbohydrate-free) diet of these tables; variety is secured by changes from Tables A and B.

[2] Any bread or cracker that can be secured of uniform size and composition will serve as well.

[3] Crystallose is superior to saccharin as a substitute for sugar.

The patient should be restricted absolutely to this diet, for two days, the urine being collected during the *second* twenty-four hours, and estimations made for the quantity of glucose and the presence and approximate amounts of diacetic and β-oxybutyric acids.[4] The next step in the diet arrangement will depend exclusively upon this analysis, and it will serve best for clearness if concrete cases be used for illustration. The analysis may show any one of the following conditions:

1. Sugar less than 100 grams, ketone bodies in small amounts.
2. Sugar more than 100 grams, ketone bodies in small amounts.
3. Sugar less than 100 grams, ketone bodies in large amounts.
4. Sugar more than 100 grams, ketone bodies in large amounts.

A case representing the features of the first postulate still retains considerable ability to assimulate carbohydrate (less being excreted than the amount in the food), and is not suffering from acidosis. This is perhaps the least difficult type to deal with, and one in which success is probable. These patients are usually past middle age and the occasion for consulting a physician is the inconvenience of polyuria, pruritus, carbuncle, etc. The method to be observed in treatment is illustrated by the following case:

CASE I.—Mrs. E. C. G., aged fifty-six years.

1907		Diet.	Urine. Amount. c.c.	Sugar. Amount. Grams.	Acetone. Grams.	Diacetic acid. Grams.	β-oxybutyric acid. Grams.	Weight. Pounds.
March	3	"Test"	1850	47.5	1.5	Trace	0	181
"	4	"C. F."	1920	38.0	1.8	Trace	0	
"	5	"C. F."	1570	11.0	Trace	0	0	
"	6	"C. F."	1580	Trace	Trace	0	0	180
"	7	"C. F."	1250	None	Trace	0	0	
"	8	"C. F."	1340	None	Trace	0	0	
"	9	"C. F."	1270	None	None	0	0	
"	10	"C. F."	1360	None	None	0	0	181
"	11	50 grams bread	1370	None	None	0	0	
"	12	50 grams bread	1290	None	None	0	0	
"	13	50 grams plus 25 grams equivalent in Table C.	1310	None	None	0	0	182

For the following ten days a choice was given of either 75 grams of bread or its carbohydrate equivalent in Tables C and D; at the same time substitutions were made in the "Test" diet for the meats

[4] The polariscope should not be depended upon for estimating sugar in diabetic urines as the error introduced by the presence of diacetic acid may be very considerable. There are modifications of the titration methods that make it possible to secure more accurate results than the polariscope gives and that require no more time or skill. Benedict's modification of Fehling's solution works admirably with a very sharp end point. The method will shortly be published in the *Journal of Biological Chemistry*. Citron's method or Gerhart's are quickly and easily done. The determination of ketone bodies is an operation that demands considerable laboratory apparatus and some experience in chemical processes; no method thus far devised yields better than approximate results. Quite as much information—if not more—can be gained from ammonia estimations which are easily made and require very little apparatus or skill.

and vegetables (Tables A and B) to give variety to the food. During this period no sugar appeared in the urine. The patient was then directed to send a twenty-four hour specimen of urine every third day and to continue the use of the diet which was by this time clearly understood by her. It will be noted that with abstractions from these tables suited to the locality and season the patient is given considerable latitude, and yet the carbohydrate fraction is kept within pretty definite limits.[5] It was found possible within the next two months by slowly increasing the allowance of carbohydrate, first to 85 grams, then by 10 gram increments, to allow 120 grams daily without sugar appearing in the urine. No attempt was made to arrive at a higher tolerance. This patient was in good health a year later and no sugar was excreted in the urine.

As an illustration of the second type in the classification (sugar more than 100 grams; ketone bodies in small amounts) the following case will serve us:

CASE II.—F. B., aged forty-two years. He has had diabetes three years, and has lost much in weight; of late he has been unable to work on account of weakness.

Date.	Diet.	Urine. Amount. c.c.	Sugar. Amount. Grams.	Diacetic acid. Grams.	β-oxybutyric acid. Grams.	Weight. Pounds.
Feb. 8	"Test"	3100	186.0	None	None	104
" 9	75 grams bread	2800	111.0	None	None	
" 10	75 grams bread	2500	93.0	None	None	
" 11	"C. F."	1160	25.3	None	None	
" 12	"C. F."	1170	20.9	Trace	None	106½
" 13	"C. F."	1250	12.1	4.4	Trace	
" 14	Oatmeal	1180	29.4	2.3		
" 15	Oatmeal	1210	20.0	None	None	
" 16	Oatmeal	1240	1.3	None	None	
" 17	Oatmeal	1190	None	None	None	106½
" 18	Breakfast, oatmeal and cream	1070	None	None	None	
" 19	Lunch and dinner.	1290	None	None	None	
" 20	"C. F." + 50 grams oat cakes.[6]	1185	None	None	None	
" 21		1240	None	None	None	109
" 22		1220	0.9	None	None	
" 23		1140	None	None	None	
" 24		1030	None	None	None	109
" 25		1280	None	None	None	
" 26		1265	None	None	None	

It will be noted that at the beginning of the treatment there seemed to be no tolerance for carbohydrates, much more being eliminated in the urine than could be accounted for in the diet. On a carbohydrate-free diet, however, the sugar excretion rapidly fell and it appeared that the urine would have been free of glucose in a few days had the diet been continued. With the diminution in sugar

[5] A suitable balance with weights may be purchased for about $5.00.

[6] Receipt for preparation at end of this paper.

excretion, however, there was an increase in acetone and diacetic acid, and the patient's condition suggested that more acids were retained than were excreted. At this juncture (February 13) two lines of procedure were open: (*a*) Alkalies might have been used to aid in the acid elimination and the same diet continued. Under these conditions—a falling sugar excretion with a slight grade of acidosis—the ketone bodies often disappear from the urine along with the sugar; the explanation apparently being that with regained ability to burn sugar the normal metabolism of the acids takes place also. In many cases small doses of alcohol at this time help to the desired end. The other alternative in treatment was, (*b*) the use of oatmeal, which is one of the surest means of combating acidosis and in many cases also decreases the sugar excretion as well. (The details of the oatmeal "cure" will be entered into later in this paper.)

This diet—oatmeal and cream for breakfast; lunch and dinner from Tables A and B, plus 50 grams of oat cakes—was continued for two weeks, February 18 to March 4; then 40 grams of white bread was allowed on alternate days, but one day in each week was kept carbohydrate-free, neither bread nor oatmeal being permitted. As no sugar appeared in the urine during this experiment and the patient liked the diet he was ordered to continue its use indefinitely; the carbohydrate-free diet list given him being made up of Tables A and B. His urine showed sugar but twice during the next three months, analyses being made every third day. He then left town and was lost sight of.

The object of reserving one day at fixed periods on which no carbohydrate is to be eaten, is that by so doing the tolerance for carbohydrate is not strained. It is, so to speak, a rest day for a special function. The indication for this occasional rest is shown in the fact that amounts of starch which are metabolized perfectly at the commencement of a given diet, may after an interval, induce a glycosuria, at first slight but daily increasing until the larger part of the carbohydrate eaten is promptly excreted.

It occasionally happens, of course, that oatmeal is not well tolerated in cases of the above type, the sugar output increasing rather than diminishing after its use. This, in my experience is exceptional; an initial rise in the sugar excretion is common, but in a few days it rapidly subsides. When, however, oatmeal is found detrimental, the method already mentioned is usually effectual in patients past middle life—carbohydrate-free diet, with alkalies to combat mild acidosis. After there is no longer loss of glucose through the urine we must proceed to build up a dietary by adding small known amounts of starchy foods, as in the cases already described, keeping these amounts within the assimilation limit of the patient and interpolating at definite periods carbohydrate-free days to aid in preserving any tolerance established.

With patients younger than the last case the difficulty is usually not so quickly nor easily overcome, although the acidosis may not be alarming early in the course of the disease. The next case to be considered comes under the same classification as the last one—sugar excretion more than 100 grams, ketone bodies in small amounts—but is much more severe and intractable to treatment.

CASE III.—S. A., aged twenty-nine years; complains of thirst and weakness. In May, 1908, he noted that he was losing flesh and strength. He improved a little during the summer without seeing his physician. He was refused insurance in September, 1908, and was told he had diabetes. He has lost about forty pounds in eight months. He has a splendid appetite, and drinks over a gallon of water a day.

Date.		Diet.	Urine. Amount. c.c.	Sugar. Amount. Grams.	Diacetic acid.	β-oxy-butyric acid.	Weight. Pounds.
Jan.	1	Standard	4200	310	+ +	None	112
"	2	"C. F." + 75 grams bread	3400	287	+ +	None	
"	3	"C. F." + 75 grams bread	1500	111	+	None	
"	4	"C. F." + 35 grams bread	1900	129	+	None	
"	5	"C. F." + 35 grams bread	2000	112	+	None	112½
"	6	"C. F." + 35 grams bread	3400	122	Trace	None	
"	7	"C. F." + 35 grams bread	1400	74.3	Trace	None	
"	8	"C. F." + 35 grams bread	1380	81.0	Trace	None	
"	9	"C. F." + 35 grams bread	1850	70.4	Trace	None	114
"	11	"C. F." (No bread)	2400	79.0	Trace	None	
"	13	"C. F." (No bread)	2475	81.6	+	None	
"	15	17th & 18th "green days"	2100	63.0	Trace	None	
"	18		1450	15.5	+	None	115½
"	21	19th, 20th & 21st oatmeal days	1450	29.0	+	None	
"	24	"C. F." + oat cakes, 30 grams	500	2.5	+	None	
"	26	"C. F." + oat cakes, 30 grams	600	None	Trace	None	
"	27	"C. F." + oat cakes, 30 grams	950	8.5	+	None	
"	28	"C. F." + oat cakes, 30 grams	2470	9.9	+	None	115½
"	29	+ 20 grams bread	2100	8.4	+	None	
"	30	+ 20 grams bread	3100	27.8	Trace	None	
"	31	+ 20 grams bread	2300	18.4	+	None	
Feb.	1	+ 20 grams bread	1775	19.5	+	None	
"	6	20 grams bread	1800	20.6	+	None	
"	9	20 grams bread	1950	8.0	+	None	
"	15	20 grams bread	2100	17.0	Trace	None	
"	21	20 grams bread	1710	None	None	None	
"	27	20 grams bread	1690	3.4	None	None	126
March	3	40 grams bread	1480	None	None	None	
"	15	40 grams bread	1520	None	None	None	135

It is to be noted here that sugar was still excreted in large amounts after five days of starch-free diet (January 10 to 15) and that three "green days" did not rid the urine of sugar. There was a rapid fall when small amounts of oat cakes were allowed along with the carbohydrate-free diet, but an immediate rise when wheat bread was substituted; indicating that only a very slight tolerance existed. The sole encouraging feature in the case was that the acidosis remained an almost negligible factor. Inasmuch as with young individuals exemplified by this case there is a marked tendency to acidosis, which must be constantly had in mind, it was not advisable to withhold starch from the diet for any prolonged period. On that account the following routine was advised to be continued for one month: One day, foods from Tables A and B, plus 30 grams of bread; two "green days;" and one oatmeal day. These days were to alternate in their above order, bread day, "green days," oatmeal day, then bread day, and so on. The urine was collected during each "bread day" which represented the maximum excretion of sugar it was found. The object of this arrangement of diet was to reduce sugar excretion by means of the "green" day and "oatmeal" day; to counteract any tendency to acidosis arising from the starvation of the "green days" by the oatmeal day and to keep up the general nutrition if possible, by means of the more liberal "bread" day. The result was so satisfactory to the patient at the end of the month that he desired to continue in the routine a while longer. At the end of three months the amount of bread had been gradually increased to 90 grams without sugar in the urine. This with its equivalents (Table C) made a considerable relaxation from the strictness of the diet on the other days.

In a case like the above nothing can be accomplished, nor should be expected, without the full coöperation of the patient. The diet, at best, is irksome and a fixed routine most disagreeable to many temperaments. Still there are but a few of the laity who do not realize something of the gravity of the disease, and this together with the amelioration of the torment of constant hunger and thirst and the increase in strength and sense of well-being render the majority of patients eager coöperators with their physician.

One word here with regard to what may be hoped for in diabetics like the last case. A minority develop after a year of treatment considerable assimilative power for carbohydrates—100 grams of bread. This is often retained for several years, but eventually becomes broken down either because of their own disregard of directions or of a too optimistic medical adviser. The majority even under strict supervision slowly lose their tolerance and in the course of a few years arrive at a condition where little if anything can be done for them. The benefit of treatment is solely in postponing the latter state and prolonging for a period some semblance of health compatible with activity and enjoyment. Very exceptionally, I think, these cases live for a decade or over even though the disease

has begun when the patient was under thirty. I have knowledge of but one such case, a man who first learned of his diabetes when he was twenty-four and died at the age of forty.

The class of diabetes in which acidosis is a prominent symptom demanding constant attention and regulation of diet next requires attention. These cases for the most part are to be regarded as a later stage in the type already discussed and the greatest care is demanded by the younger patients, since they not only develop alarming grades of toxemia very quickly but also withstand it poorly.

The following case is an example of this type:

CASE IV.—J. B., aged twelve years. The patient was a healthy girl until about a year ago when she began to have great thirst, an abnormally increased appetite, and to lose in weight. The family physician found sugar in the urine and ordered a diabetic diet, which caused the child to improve for a while, but she soon was as bad off as before, and the parents in consequence brought her to the hospital. On admission the child looked flushed and toxic, and the first urine voided was found to give an intense reaction for diacetic and β-oxybutyric acids. Oatmeal diet was directed in an amount sufficient to give adequate calories for nourishment: oatmeal, 6 ounces; butter, 1½ ounces; 2 eggs; water, 24 ounces; 6 ounces of this gruel was given every four hours.

Date.	Diet.	Urine. Volume. c.c.	Sugar. Grams.	Acetone + diacetic Grams.	β-oxybutyric acid. Grams	Nitrogen.	Ammonia.	Weight. Pounds.
March 10	Oatmeal	2700	175.0	1.47	2.65	12.89	2.02	51
" 11	Oatmeal	1400	70.0	1.18	1.70	8.51	1.40	
" 12	Oatmeal	780	15.6	0.18	0.11	3.9	0.80	
" 13	Oatmeal	850	0.8	0.40	0.38	7.6	0.81	
" 14	Oatmeal	760	Trace	0.25	0.21	7.1	0.80	52
" 15	"C. F."	810	None	0.19	0.26	9.1	0.86	
" 16	"C. F."	840	Trace	0.17	0.25	9.7	0.88	
" 17	"Green day"	790	None	0.28	0.20	6.9	0.92	52½
" 18	Oatmeal	750	Trace	0.20	0.13	7.5	0.81	

It is unnecessary to continue the table further, as the above gives an adequate idea of the patient's condition. The urine could not be freed of sugar for more than a day at a time, because the necessary restrictions induced a prompt increase in ketone bodies. All that was accomplished in the above case after a month's treatment was a gain in weight and a marked increase in sense of well-being to the patient. No substantial tolerance for carbohydrate was established nor could be expected. If we can make such individuals comfortable we must be satisfied in the present state of our knowledge and by doing so we are able to prolong life. The following case was one of the most severe I have seen, and from the first hopeless, yet the child was kept sufficiently well to enjoy life until the day before she died—a period of two and a half years.

CASE V.—C. G., aged four years, was brought by her father who also had diabetes and had had Graves' disease. Sugar was first found in the child's urine in December, 1907. At first, by careful supervision, the urine was kept almost constantly sugar free during the winter and spring of 1907 and 1908, allowing 25 to 30 grams of bread. At this time there was no tendency to acidosis. During the summer of 1908, no sugar was excreted for sixty days, but the tolerance had diminished, as it continued to do gradually until in October, 1908, a carbohydrate-free diet was necessary to secure glucose-free urine. On a diet of 8 grams of rice in the morning and 8 grams of zweiback at noon and night, 7 grams of glucose appeared in the urine. A slight grade of acidosis first made its appearance at this time, but a satisfactory condition was maintained until January, 1909. Then, coincident with otitis media an alarming degree of acidosis suddenly developed, as evidenced by symptoms and urine analyses. Ten days of exclusive oatmeal diet was necessary to carry the patient through this complication. Following the recovery from the otitis media it was found that the glucosuria could be controled only by the use of "green days" in alternation with oatmeal days for the acidosis. The routine was one vegetable day followed by two days of liberal diet on which definite amounts of starchy foods were allowed. Then again a vegetable day, two oatmeal days, a vegetable day, and so on. With this regimen the patient regained the weight lost during the acute illness and appeared very well until early spring of 1909. From April, 1909, the urine could not be longer freed of sugar and the amount of ketone bodies excreted seemed to threaten toxemia, although the child appeared quite well usually and played with other children a large part of each day. Oatmeal no longer produced any effect on the glycosuria and because of abdominal distention and pain, which it appeared to induce, was abandoned as a gruel and used only as cakes with other food.

Date.	Diet.	Urine. Amount. c.c.	Sugar. Amount. Grams.	Acetone + diacetic Grams.	β-oxybutyric acid. Grams.	Total N.	NH_2 N.
Oct. 19, 1908	8 grams rice and zweiback 16 grams	800	6.21	0.55	0.14	7.1	0.70
Apr. 22, 1909	Vegetable day	1260	13.40	0.29	0.38		
" 26,	Oatmeal	3240	106.4	1.88	0.20		
" 29,	"C. F." + levulose apples	2935	85.1	3.25	5.88	11.44	2.39
May 2,	Oat cakes	2400	84.9				
" 6,	Oat cakes + apples	2520	64.7	2.69	4.16	9.12	2.22
" 12,	Graham cakes + apples	1830	67.7				
" 20,	Oat cakes	2500	46.0	4.35	4.74	10.44	2.12
" 26,	Oat cakes	2490	65.0				
June 7,	Oat cakes	3200	81.0				
" 20,	Oat cakes	2500	48.2	2.93	6.96	11.15	1.88
July 5,	Oat cakes, alkalies	2000	50.0	3.06	3.70	6.01	1.42
" 10,	Oat cakes, alkalies	2300	98.9			3.84	0.55
" 14,	Oat cakes	2000	106.0	3.14	6.52	3.24	0.58

Coma supervened on July 20 and resulted fatally on the following day. Infusion with alkalies was not considered on account of the hopeless condition of the child before coma began. This case represents the severest and most desperate manifestation of diabetes, especially when it occurs in so young a person. And it must be confessed that this child owed her two years of life as much to the intelligent care and resourcefulness of the mother as to her physician.

The cases that have been cited serve to show the methods that may be employed to meet definite indications. I have called them typical, but it is to be understood that type is meant only in the gross sense. Every case of diabetes is peculiar in some or perhaps all of its features and so there are no types in an exact sense. The secret of treatment is the individual treatment, the adaptation of methods to the peculiarities of each case. There is no diet adapted to all, not even to all of a gross type.

Acidosis. As acidosis is the complication most to be feared in every case of diabetes the subject demands more than a passing word.

Despite every care that we know how to exercise, many diabetics develop a severe degree of acidosis which sooner or later terminates life. It is not yet clear whether the development of ketone bodies is to be interpreted as an entirely abnormal type of metabolism, or whether these substances are intermediate metabolic products which the diseased organism cannot split in the normal manner to their proper end products: CO_2 and water. The source of β-oxybutyric acid (the mother substance from which diacetic acid and acetone are derived) is mostly from the fatty acids. It is conceivable that any streight chain fatty acid with an even number of carbon atoms in its molecule may break down into butyric acid, and for many such acids the fact has been demonstrated. In a less degree, but doubtless to some extent, protein may also give origin to the ketone bodies, since the amino-fatty acids are readily disamidized in the body and are then to be regarded as simple fatty acids.

As a usual thing, it is far easier to postpone the initial development of acidosis than it is to cope with the pronounced condition once it has become fixed. But I am convinced that the feeding of carbohydrate food when such food is not assimilated, but passes through the body into the urine does not in any way delay acid toxemia. Carbohydrates that are burned, on the contrary, do prevent acidosis, causing the acids, it may be, to be burned also. It is for this reason probably, that the oatmeal diet acts so well in many cases of acidosis. The carbohydrate in this case is burned, and in those individuals who retain for some time a carbohydrate tolerance, it is to be noted that the acidosis does not reach an alarming degree until such tolerance has utterly failed. There are

some features of this intoxication that find analogies in inanition; for example, the excretion of ketone bodies reaches a surprising extent in many cases of gastric ulcer under the von Leube treatment.

When no bread or its equivalent can be allowed without the appearance of corresponding amounts of sugar in the urine the interpolation of oatmeal days is the best way to proceed. Later in the course of the disease several such days may be necessary and in a few cases I have ordered this diet unremittingly for two weeks. In some cases the appearance of ketone bodies in the urine may be quickly checked by the addition of alcohol in some form to the dietary.[7] In these, strange as it may seem, the tolerance for carbohydrate appears improved by this measure.

This is perhaps as good a place as another to speak of levulose. As is well known, some diabetics can assimilate this sugar when not able to use any other, and on this account it has been much over-used by physicians. The tolerance for levulose is never large and is invariably short lived if the sugar be constantly eaten. On that account it should be employed in small amounts and never constantly. In Germany, a levulose chocolate is much used as a confection for diabetics and satisfies that hunger for sweets which many have. It is also convenient with fruits, apples, cranberries, currents, to manufacture marmalades and preserves. Levulose, if used discreetly, is a valuable aid in preventing acidosis, but it is an aid only so long as it is metabolized.

In spite of the best of care the majority of the younger cases of diabetes will sooner or later develop severe grades of acidosis, evidenced not only by the ketoneuria but by loss of appetite and somnolence. For this, besides the diets already mentioned, we have to resort to large doses of alkalies, sodium bicarbonate alone or mixed with a quarter to half its weight of citrate. Some patients prefer to take the alkalies in capsules, others find them not too unpleasant when dissolved in water.

A final word with reference to infusion with alkalies in diabetic coma. Enormous quantities of alkalies are often required to produce any effect. It is advisable to use 4 per cent. sodium bicarbonate solution and to repeat the procedure until 100 grams has been administered. As soon as possible, if consciousness returns, alkalies should be given by the mouth also. The length of life following a successful treatment of coma is in the vast majority of cases so brief that the operation is not suited to every case. It hardly seems justifiable, for instance, in the case of children when all that may reasonably be expected is a few days more of precarious existence.

Diet Tables. In an attempt to arrange a dietary for a diabetic it is necessary to give as much variety in foods as possible. If this be not considered the patient becomes disheartened with the restriant,

[7] This was first called to my attention by a case of Friedrich von Müller at his Munich clinic

the appetite fails, and he loses in weight and strength. In the following tables the effort is made to gain the greatest possible variety and at the same time to control absolutely the carbohydrate ingest. Tables A and B are made up of foods that are nearly carbohydrate free and from these lists this sort of dietary may be constructed according to the patient's preferences. These foods (Tables A and B), may be used without restriction of quantity unless there is a necessity of limiting the amount of protein consumed. In Tables C and D the foods all contain carbohydrate. These tables are to be used only when the carbohydrate tolerance of the patient is known, and then the total amount of starch-containing food should be kept well below the tolerance limit (by at least 10 grams of bread). For example, if 60 grams of white bread is assimilated without inducing glycosuria, then not more than 50 grams in equivalents should be allowed. Further, foods like potatoes and fruits should be separately tested with each patient in order to determine whether there is any peculiarity of reaction toward them respecting sugar excretion.

The order and number of meals requires consideration also; four or five meals are better than three; a second breakfast and afternoon tea may be interpolated. Half of the daily allowance of bread should be taken at the mid-day meal and it is better that at least a third of the daily bread allowance be used as equivalents —vegetables and fruits.

Table A.

Fresh Meats: All muscle parts of beef, veal, pork, lamb, mutton, domestic, and wild fowl, either roasted, boiled, or broiled, in their juices, with butter, or with mayonnaise made without flour, either hot or cold.

Various Organs of Animals: Tongue, heart, brains, sweetbreads, kidneys, marrow, calves' liver, liver of game or poultry (pate de fois gras) up to 100 grams in weight, weighed after being prepared.

Preserved Meat: Smoked meat, dried meat, smoked or pickled tongue, ham or bacon, corned beef, sausage (containing no bread). Be sure that no flour is used in preparing pickled meats.

Meat peptones of all kinds, jellies, or aspics prepared from calves' feet, or pure gelatine; nutrose, tropon, plasmon, wheat gluten, etc.

Fresh Fish: All fresh fish boiled, fried, or broiled. If the fish is fried in bread crumbs and eggs the crust should be removed before the fish is eaten. All sauces that contain no flour are allowed; those that contain butter and lemon are the best.

Preserved Fish: Dried, salted, and smoked, such as haddock, cod, herring, mackerel, flounder, sturgeon, eels, salmon, etc. Pickeled herrings, sardines in oil, mackerel in oil, anchovy, tunnyfish, etc.

Fish Products: Caviar, cod-liver oil.

Shell Fish and Crustacea: Oysters, clams, and other shellfish, lobsters, crabs, crawfish, shrimps, turtle, etc.

Table B.[8]

Foods Rich in Fats: Dairy products—cream, butter, yolks of eggs, cheese.

Animal fats—bone marrow, fat of edible meats, lard, tallow (used in cooking), cod-liver oil, oleomargarine. *Vegetable fats*—olive oil, cottonseed oil, peanut oil, peanut butter, nut butter.

[8] These tables are based on the composition of foods as given in Bulletin 28, United States Department of Agriculture, and on the Nährungsmittel Table of Schall and Heisler.

Vegetables containing a slight amount of carbohydrate (less than 4 per cent.). These may be taken in normal quantities unless otherwise directed: Asparagus, 2 per cent.; beet greens, 3.2 per cent.; Brussels sprouts, 3.4 per cent.; cabbage, 4.8 per cent.; celery, 3.3 per cent.; chard, 3.4 per cent.; cucumbers, 3.1 per cent.; endive, 2.2 per cent.; lettuce, 2.9 per cent.; sauerkraut, 3.8 per cent.; spinach, 2.8 per cent.; string beans, 1.9 per cent.; tomatoes (fresh), 3.9 per cent.

TABLE C.—Foods Containing Carbohydrate and to be Used Only in Restricted Quantity.

	Grams.	Grams.	Grams.	Grams.
White bread	10	20	30	50
	Equivalent to	Equivalent to	Equivalent to	Equivalent to
Corn bread	12	24	35	60
Graham bread	10	20	30	50
Gluten bread	13	26	39	65
Oat cakes	25	50	75	125
Wheat flour	8	16	24	40
Hominy (boiled)	20	38	50	
Rice (boiled)	14	28	42	
Tapioca (pudding)	15	30	45	
Macaroni (cooked)	30	60	90	
Spaghetti (cooked)	30	60	90	
Cocoa (unsweetened)	12			
Vegetables:				
Asparagus (cooked)	175	350[9]		
Beans, red kidney	25	50		
Beans, lima	25	50		
Beets (cooked)	55	100		
Cabbage (raw)	78	156		
Carrots (raw)	60	120		
Celery (raw)	100	200		
Corn, green, canned	25	50		
Cauliflower (raw)	80	160		
Dandelion greens	50	100		
Egg plant (cooked)	90	180		
Onions (boiled)	90	180		
Peas, green (cooked)	30	60	90	
Parsnips (raw)	40	80		
Potato (boiled)	25	50	75	
Fruits:				
Apples (raw)	35	70		
Apricots (stewed)	40	80		
Bananas	25	50		
Blackberries (fresh)	35	70		
Cherries (fresh)	25	50		
Currants (fresh)	40	80		
Grape fruit	200			
Gooseberries	75	150		
Oranges	30	60		
Peaches	50	100		
Pears	40	80		
Plums	27	54		
Prunes (stewed)	25	50		
Raspberries	42	84		
Strawberries	60	120		

[9] When no equivalent amount is mentioned in the third column, it is to be understood that the amount given in the second column is the maximum allowable.

Table D.

This table consists of a list of food materials which are not entirely free of sugars. They are allowed in quantities stated unless the patient is on a "carbohydrate-free" diet, when they must be avoided.

Vegetables (cooked without flour or sweetening): Dried peas and beans, either whole or in puree, turnips, carrots, salsify, green peas, lima beans, kidney beans, 2 tablespoonfuls.

Fresh Fruit: Apples, pears, apricots, peaches, 50 grams. Raspberries, strawberries, red currants, 1 large tablespoonful. Blackberries, 2 tablespoonfuls.

Stewed Fruit (with saccharine or crystallose): Plums, apples, pears, apricots, peaches, sour cherries, prunes, 1 heaped teaspoonful. Raspberries, gooseberries, red currants 2 heaped tablespoonfuls.

Dried Fruit: Plums, apricots, peaches, apples, prunes, 2 heaped tablespoonfuls.

Levulose chocolate (Stollwerck's) up to 15 grams.

Cocoa (without sugar) up to 12 grams.

How to Make Use of Table C.

The food is divided into two parts: (1) That which is free from carbohydrates, the principal fare, Tables A and B; and (2) that which contains carbohydrates, the secondary fare, Tables C and D. For instance, 75 grams of wheat bread are allowed in courses from Table C.

Breakfast: Principal fare, medium strong coffee or tea, cold meat, 1 egg and butter; secondary fare, 50 grams of oat cakes, the equivalent of which = 20 grams of wheat bread.

Second Breakfast: Two eggs in any form.

Dinner (mid-day meal): Principal fare, broth with egg, meat with green vegetables or salad (Table B), cheese and butter. Secondary fare, 50 grams of potatoes (= 20 grams of wheat bread), 60 grams of strawberries (= 10 grams of wheat bread).

Afternoon Meal: Tea, coffee, or consommé, with casoid cakes.

Supper: Principal fare, plenty of hot or cold meat, with vegetables or salad, cheese and butter; secondary fare, 25 grams of Graham bread (= 25 grams of wheat bread). Total, = 75 grams of wheat bread.

Oatmeal Diet. There is, at present, no scientific reason for the peculiar effect that oatmeal exercises on many diabetics; it is, however, true that in many cases in which large amounts of sugar are being excreted on a carbohydrate-poor diet, the institution of an exclusive oatmeal diet will result in the course of a few days in a sugar-free urine. This I have found most frequently in young diabetics, in whom the change effected by a week's treatment is sometimes wonderful, but it is in these very instances that one must not allow relatives of the patient to be deceived by the brightness of the outlook. The oatmeal diet is by all odds the best method of treating acidosis, and on this account it is not contraindicated in any type of case. Quite commonly with new cases in which there is some toxemia it is the best food to use for a few days, and leads the way to other methods. The chief obstacle that is encountered in the prolonged use of oatmeal is the intestinal derangements that ensue therefrom, taking the form of diarrhœa or severe constipation, and usually associated with marked tympanites. These symptoms are more prone to occur in children than with adults, but I have observed this only when the oat "cure" had been continued for over a week without intermission.

The most expedient mode of employing the oatmeal diet is as follows: An adult diabetic requires 16 calories of food value per pound body weight; if the patient weighs 150 pounds, he would need 2400 calories. Five ounces of butter—as much as can be

well taken—is equivalent to 1125 calories which leaves 1275 to be made up by the oatmeal. One ounce of dry oatmeal is equal to 113 calories, or 11 ounces to 1230 + calories. This amount (11 ounces) is weighed out and put into three pints of water, slightly salted, and thoroughly cooked for at least six hours; then while still hot it should be strained through a sieve. If the cooking is thoroughly done only the coarse covering of the kernel will remain on the sieve. The butter is added while the thick porridge is still hot and stirred into it. This is one day's food and may be taken, equal fractions—about seven ounces—every two hours or a larger allowance less frequently. No other food is to be permitted except a little black coffee or some brandy. This diet may be used three or four days at intervals without any hardship; longer periods require some fortitude on the part of the patient and firmness from the medical adviser.

Green Days. The object of the "green" or "vegetable" day is to decrease the food ingest, chiefly the protein factor. This is demanded in some cases because the ability to utilize carbohydrate is so slight that not even that resulting from the breaking down of the protein molecule is not burned. A "vegetable" day is then an attempt to put completely at rest a certain function, and in making up the dietary for such a routine the less protein entering into the food the better; of course, all carbohydrates are excluded. The bulk of food taken, therefore, is fat, and as this is of necessity small, a vegetable day amounts to the starvation days advised by Naunyn, with a thin disguise. The vegetables that may be used in this diet are any of the green variety that contain little or no carbohydrate other than cellulose (Table B); of these spinach, celery, cabbage, beet-tops, and the salads serve best. These may be varied to suit the taste of the patient.

The vegetable day might be ordered as follows:

Breakfast: A cup of coffee, a teaspoonful of cream, 3 egg yolks, served as omelet, with tomatoes and parsley.

Luncheon: 1 cup of bouillon; asparagus with egg sauce.

4 P.M.: A cup of coffee or a glass of wine with 1 casoid biscuit.

Dinner: A cup of bouillon; 1 box of sardines;[10] spinach (boiled); 1 glass of wine or whisky.

Vegetable days are prone to increase markedly the formation of ketone bodies, and on this account, if the patient's urine shows the ferric chloride reaction before the diet is commenced, alkalies should be given during the vegetable day; 25 grams of a mixture of equal parts of sodium bicarbonate and citrate is usually sufficient. Vegetable days have their function in diminishing the sugar excretion, and in order completely to free the urine from sugar several vegetable days may be necessary.

[10] The smoked Norwegian sardines are much more satisfactory than the other varieties on account of the flavor.

When this is the case, however, a most careful urine analysis is necessary daily to determine the degree of acidosis. When severe grades of ketonuria are caused by these "green days" it is best to follow them with one day of oatmeal. The number of days of each variety of diet (that is, vegetable days, "green days" and carbohydrate days), is a matter which must be determined by experiment with each individual.

Finally, it should be realized that the sugar output and acidosis are not the sole features on which success is to be judged. Patients must be frequently weighed and a constant loss of weight in a young person is quite as bad an omen as a large sugar output. Even with the most rigid diet regimen the nutrition should be maintained.

The dietary of the diabetic often seems to him extremely limited, and this can only be helped by variety in the manner of cooking foods. The receipts here appended are for the most part contributions from the families of patients.

SOUPS. *Consommé:* 3 pounds of beef from the round, 1 small knuckle of veal, 5 quarts of cold water—simmer four hours, then add: 1 pound each of carrots, turnips, and onions cut into dice, 1 teaspoonful of salt, ½ teaspoonful of sweet marjoram, ½ teaspoonful of thyme, 1 teaspoonful of peppercorns, 1 bay leaf, 1 sprig of parsley. Simmer one hour, strain and cool; when cold skim off the fat.

Consommé with Brussels Sprouts: To three pints of hot consommé add 2 cupfuls of Brussels sprouts which have been soaked in cold water twenty minutes, and boiled in boiling salted water fifteen minutes.

Consommé with Claret: To 1 pint of consommé add 1 pint of claret, 1 pint of hot water, pour 1 cupful of consommé over the yolks of 3 eggs; cook until the spoon is coated; add the beaten egg whites. Mix and serve either hot or cold.

Consommé with Cucumbers: To 3 pints of consommé add 2 sliced cucumbers which have been cooked one-half hour in 1 cupful of water. For the cucumbers may be substituted, red or white cabbage, cauliflower, asparagus, cooked meats chopped, or Parmesan cheese.

Tomato Soup: Stew tomatoes with butter, strain, and add an equal quantity of consommé.

Jacobin Cubes: Beat 3 eggs in a bowl, add some nutmeg and 3 teaspoonfuls of water; place the bowl in boiling water until the mixture thickens; cut in cubes and serve in broth.

For pureés, rub through a sieve cooked cauliflower, asparagus, or tomatoes; add to 3 pints of hot consommé and pour over 1 cupful of cream in which 2 egg yolks have been stirred.

SAUCES. *Cucumber Sauce:* Cut up 2 cucumbers in cubes after removing the seeds, stew them in 1 cupful of sour cream until

soft. Stir up 1 egg yolk with 1 cupful of cream in a double boiler until it thickens; add this to the cucumbers and heat again; season with salt and peper.

Sauce Tartare: Slowly stir 1 egg yolk adding ½ cupful of olive oil, drop by drop, 2 tablespoonfuls of vinegar, also by drops, salt, pepper, 1 teaspoonful of French mustard and a little parsley. Stir on ice.

Mustard Sauce: 1 pound of melted butter, 1 pound of French mustard covered with broth, ¼ teaspoonful of salt, 1 teaspoonful of vinegar, take off the fire and beat in 1 yolk.

Horseradish Sauce: Stir a piece of butter with 2 tablespoonfuls of grated horseradish, add pepper and salt, cover with broth, and boil for one-half hour.

Brown Onion Sauce: 2 onions chopped and stewed in butter until brown, covered with broth, 1 teaspoonful vinegar, pepper, a clove, a bay leaf, a slice of lemon.

Sauce Bearnaise: Cook in double boiler, stirring constantly, 3 egg yolks, 1 teaspoonful of water, 1 teaspoonful of butter; add one at a time, 4 tablespoonfuls of butter; stir until boiling, and add 1 teaspoonful each of tarragon, or plain vinegar, tarragon leaves, and parsley minced.

Tomato Sauce: Tomatoes after being passed through a sieve are stewed in butter and covered with broth.

Mushroom Sauce: Mushrooms are stewed in butter and covered with broth or gravy. Take off the fire and beat in 1 yolk.

White sauce for asparagus, artichokes, etc.: Mix 1 tablespoonful of butter, 2 yolks, and 1 cupful of cream, cold; cook in a double boiler, beat constantly until thick. Serve immediately.

Spinach Pudding: Mix with 1 quart of boiled spinach 4 yolks, add ½ onion, ½ cupful of cream, whites whipped stiff, and ½ cupful of ham cut in cubes. Place the mixture in a well-buttered dish and steam in a "bain Marie."

Baked Cauliflower: Place soft boiled cauliflower in an open pie dish, pour sour cream, melted butter, and parmesan cheese over it; then bake in the oven.

Tomato Jelly Salad: To one can of stewed and strained tomatoes, add 1 teaspoonful of salt and ⅔ box of gelatin soaked and dissolved. Pour into small cups and chill. Serve on lettuce leaves with mayonaise dressing.

Oatmeal Muffins: To 2 half-pint-cupfuls of finely ground (coffee grinder) oatmeal add 1 heaped teaspoonful of Royal baking powder and ½ teaspoonful of salt. Mix well, add 1⅓ cupfuls of cold water, and at last a piece of melted butter (or lard) the size of an egg. Beat well for a minute, put in muffin tins, and bake in a hot oven.

Coffee Mousse: 1 quart of thin cream; 1 cupful of strong coffee; 1¼ tablespoonfuls of granular gelatine; 2 tablespoonfuls of cold

water; 3 tablespoonfuls of hot water, and saccharine to taste. Add the gelatine soaked in cold water and dissolved in boiling water to the coffee. Set the mixture in a pan of ice water and stir until it begins to thicken; then fold in whipped cream, put in mold cover, pack in equal parts of salt and ice, and let stand four hours.

Stuffed Eggs: Mash up the yolks of 5 hard-boiled eggs with a lump of butter, thicken with parmesan cheese, 1 raw egg, and some sour cream. Fill the whites of the 5 eggs, tops and bottom with this mixture, place in a buttered tin, sprinkle with cream and cheese, and bake in the oven.

Ragout Eggs: Mash the yolks of 6 hard-boiled eggs with a fork, slice 2 onions and stew them in 2 tablespoonfuls of butter until they are soft without allowing them to brown. Add the yolks with salt, pepper, marjoram, and nutmeg, and stir in a cupful of sweet cream. Garnish the dish with the whites quartered.

Lemon Soufflé: Stir 4 yolks until they thicken, sweeten with saccharin, add the juice of half a lemon, some lemon rind grated, and 4 whites whipped stiff. Bake for ten minutes.

Wind Puffs: For 2 wind puffs stir 4 whole eggs, 2 tablespoonfuls of sweet cream, a pinch of salt, and a little saccharin, well for half an hour until the mixture is turned into a stiff froth. Pour into two buttered tins and bake in a hot oven for about half an hour. Serve hot with whipped cream.

Fish Scallops: 1 cupful of cooked fish freed from bone. Mix with 1 egg, capers, parmesan cheese, salt, and sour cream. Butter the scallops, fill in the mixture, sprinkle with powdered parmesan cheese, and bake in oven.

Cheese Soufflé: Grate 4 ounces of parmesan and $2\frac{1}{2}$ ounces of Swiss cheese. Stir well with $4\frac{2}{3}$ ounces of fresh melted butter, the yolks of 8 or 10 eggs and the whites beaten stiff. Season with ground white pepper and salt. Fill two small porcelain moulds, bake slowly for from ten to fifteen minutes, then serve quickly.

Cabbage Soufflé: Boil white cabbage in salt water. Chop fine, then stew with an onion and 1 pound of minced pork. Beat up 2 eggs with 6 or 8 spoonfuls of sour cream; whip 2 whites of egg; then stir the whole into the cabbage. Fill a buttered tin, sprinkle with parmesan cheese, and bake in the oven for one hour. Serve with tomato sauce.

Coffee or Orange Charlotte: $\frac{1}{3}$ box of gelatin; $\frac{1}{3}$ cupful of cold water; $\frac{1}{3}$ cupful of boiling water; 3 tablespoonfuls of lemon juice; 1 cupful of orange juice and pulp or 1 cupful of coffee; and the whites of 3 eggs. Whip from 2 cupfuls of cream, saccharin to taste. Soak the gelatin in cold water and dissolve in boiling water; strain, and add to juice or coffee; chill the mixture in a pan of ice water; when quite thick beat with wire whisk until frothy, then add the whites of the eggs beaten stiff, and fold in cream. Turn into wet mould and chill.

Spanish Cream: ¼ box of gelatin; ¼ cupful of cold water; ¾ cupful boiling water; 3 eggs; ½ teaspoonful of salt; 1 pint of milk; vanilla, 1 teaspoonful; and saccharin to taste. Soak the gelatin in cold water, dissolve in boiling water. Make a custard with the yolks of the eggs beaten, and mixed with salt. Pour on the hot milk, and cook in double boiler until it thickens. Add the strained gelatin water, vanilla, saccharin, and the whites of the eggs beaten stiff. Mix well and turn into a mold wet in cold water. Place on ice until hard.

Boiled Custard: The yolks of 3 eggs; ½ teaspoonful of salt; 1 pint of hot milk; ½ teaspoonful of vanilla; and saccharin to taste. Scald the milk. Beat the yolks, add the salt, and the saccharin, and pour the hot milk slowly into the eggs; when well mixed, pour all back into the double boiler, and stir constantly until smooth and thick like cream; strain when cool, and add vanilla.

Snow Pudding: ¼ box of gelatin; ¼ cupful of cold water; 1 cupful of boiling water; ¼ cupful of lemon juice; the whites of 3 eggs, and saccharin to taste. Soak the gelatin in cold water, dissolve in boiling water, strain, add the lemon juice and saccharin, and set in ice water to cool. Stir occasionally. Beat the whites of the eggs to a stiff froth, and when the gelatin begins to thicken add the beaten whites and beat all together until very light; chill in a wet mould. Serve with boiled custard.

Coffee Jelly: ½ box of gelatin; ½ cupful of cold water; 1 cupful of boiling water; 3 cupfuls of coffee, and saccharin to taste. Soak the gelatin in cold water, dissolve in boiling water, and strain into sweetened coffee; pour into a wet mould and chill until firm. Serve with whipped cream.

Baked Custard: 1 quart of milk; 6 eggs; 1 teaspoonful of salt, and saccharin. Scald the milk. Beat the eggs, add the salt, and sweeten; then add the scalded milk. Strain, add a little nutmeg, and bake about twenty minutes in a dish set in a pan of warm water or in custard cups set in water.

Almond Cake: Beat ½ pound of butter and 8 egg-yolks vigorously for one-quarter hour. Mix 20 grams of baking powder, 100 grams of plasmon, lemon rind grated and the juice of 1 lemon, 1 teaspoonful of vanilla, and ¼ pound of finely chopped almonds, and add to the beaten yolks. Sweeten with saccharin, and lastly fold the 8 whites into the mixture and bake in well-buttered tin for one-half hour.

Chocolate Sauce: 1 tablespoonful of diabetic chocolate in a double boiler with ½ pint of milk, and 3 egg-yolks. Stir until it begins to thicken. When cold, add a pint of whipped cream.

Pudding a la Nesselrode: Stir 5 yolks over the fire with a little water until they thicken, add 7 ounces of finely chopped almonds, 9 tablespoonfuls of cognac, 1 tablespoonful of dissolved gelatin, and 15 whites whipped stiff. Fill into a mould rinsed with water.

A RESUME OF VACCINE THERAPY.

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In reviewing the work of various authorities with vaccine therapy, no claim is made that the statements given by them are correct in every detail, and the reader is cautioned to make allowance for the many factors that might have influenced the apparent results obtained. Among these may be mentioned: the overzealousness that often exists in taking up a new work or in trying a new remedy which may sometimes eclipse the better judgment of an observer; the part that nature plays in effecting a spontaneous cure in a given case may be overlooked, or the results obtained when viewed through the eyes of a less enthusiastic and more stoical observer might present a different picture. There is also the question whether the cases under consideration were mild or severe in character or whether they were typical cases. It must also be remembered that a large number of sporadic cases in which brilliant results have been obtained are reported, while probably a larger number of cases that have been unsuccessfully treated are not reported.

It is realized that statistics at best are not always reliable, and perhaps, when it is impossible to make comparisons with other modes of treatment, they are undesirable; however, when the results obtained by a number of observers closely coincide, it is only fair to conclude that such results indicate the value or uselessness of the method of treatment under consideration.

In order to arrive at a definite conclusion as to the value of a method of treatment of a given disease, it is desirable to consider as large a number of cases as possible; and, while the medical literature abounds in articles on vaccine therapy, they are scattered through a large number of medical journals, covering several years. It is with the hope that by grouping together the cases from the literature that the reader may at a glance gain a better comprehension of the work being done and the results accomplished in this line, that this paper has been written.

Assuming that the majority of readers will be more interested in the results accomplished in specific conditions, a classification has been made according to diseases instead of the more scientific method usually employed in articles of this nature, in which the classification is made according to the specific organism.

GENERAL INFECTIONS.

Actinomycosis.

Wynn[152] has successfully treated a case of actinomycosis of the lung with a vaccine made from a culture of Streptothrix bovis.

The first inoculation resulted in a marked diminution of the purulent discharge; the temperature dropped to normal, and continued so for three days, after which there was a slight rise. After the second injection, however, it again became normal, and remained so. Six injections were given during eleven weeks, at the end of which time the patient was discharged cured. One year after inoculation the patient was still in good health.

Bubonic Plague.

Bacterial vaccines have been used a number of years in the prophylactic treatment of bubonic plague by Haffkine,[51] with marked success. He states that of 639,630 persons in whom the vaccine had not been used, 49,433, or 7.7 per cent., developed the disease, and 29,733, or 4.7 per cent., died; whereas, of 186,797 who had been inoculated with plague vaccine, only 3399, or 0.8 per cent., developed the disease, with 814, or 0.4 per cent., deaths. Haffkine is under the impression that early use of the vaccine may abort the disease.

Cholera.

Haffkine[50] has also used bacterial vaccines in the prophylaxis of Asiatic cholera with success. He states that about ten times the number of those not inoculated are attacked to those that are inoculated. Powell[101] has collected the following statistics:

Of 6549 that did not receive the inoculations, 198, or 3 per cent., developed the disease, and 124, or 1.8 per cent., died; of 5778 that had received the inoculations, only 27, or 0.46 per cent., were attacked, and 14, or 0.24 per cent., died. The vaccine does no good when the disease is once contracted. The immunization lasts about fourteen months.

Glanders.

Two cases of glanders treated with bacterial vaccines by which cures were effected have been reported, one by Bristow and White,[16] and the other by Zieler.[153] Both were general infections.

Pyemia.

Authors.	Cases.	Cured.	Improved.	Remarks.
Floyd[41]	1	0	0	Not benefited.
Crofton[33]	1	1	0	
Oastler[96]	1	0	1	
Grove[42]	1	1	0	
Harris[48]	1	1	0	
Thompson[124]	1	1	0	
Hoobler[63]	2	2	0	
McDonald[83]	5	4	0	One not benefited.
Oastler[97]	1	1	0	
	14	11	1	2 not benefited.

In pyemia, the inoculation treatment seems to have met with general success, although the number of cases in this series is rather small to form any definite opinion.

Scarlet Fever.

Smith[125] has collected from the literature 4771 preventive inoculations against scarlet fever with a vaccine made from a bouillon culture of a streptococcus isolated from a person ill with scarlet fever and killed by heating to 60° C., according to the method described by Gabritschewsky.[43] These vaccines were used by physicians in epidemics of scarlet fever occurring in Russian villages in which 15 per cent. to 70 per cent. of the uninoculated were stricken with the disease. Of those that had received three doses of the vaccine, none were effected; of 2034 that had received two or more vaccinations, only 2 were attacked; of 2737 others who had received only one dose of the vaccines, 41 were attacked. Most of the cases that had received vaccine treatment ran an exceedingly mild course. Three injections of the vaccine is supposed to confer immunity for about one and one-half years.

Septicemia.

Authors.	Cases.	Cured.	Improved.	Remarks.
Unclassified.				
Boelike[13]	1	1	0	
Harris[66]	2	2	0	
Hartwell[80]	9	0	5	Four not benefited.
White and Eyre[142]	1	1	0	
Allen[3]	2	2	0	
McDonald[82]	7	3	0	Four not benefited.
Floyd[41]	1	1	0	
Turton[133]	1	1	0	
Gonococcic.				
Eyre[38]	1	0	1	
Dieulafoy[36]	2	2	0	
Irons[68]	3	0	0	Not benefited.
Miller[92]	1	1	0	
Puerperal.				
Lloyd[79]	2	0	2	
Floyd[41]	1	1	0	
Richardson[103]	2	1	0	One not benefited.
Bristow[18]	2	2	0	
Martyn[89]	1	1	0	
Crowe[34]	1	1	0	
Turton[133]	3	1	1	One not benefited.
Strubell[127]	1	0	1	
Oastler[96]	2	1	0	One not benefited.
Leary[77]	47	43	0	Four not benefited.
White[142]	1	0	0	Not benefited.
Hartwell[80]	18	18	0	
Hoobler[63]	3	3	0	
Oastler[97]	2	1	0	One not benefited.
Sherman[120]	1	1	0	
	118	88	10	20 not benefited.

Of the cases of septicemia that have not been classified, 8 were due to the streptococcus, 4 to the pneumococcus, 1 to Friedländer's bacillus, 1 to the colon bacillus, and 1 was a mixed streptococcic and staphylococcic infection, and in the others, the causative organism was not given. Of the cases not benefited by vaccine therapy, 4 were due to the streptococcus and 4 were cases of which the organism was not given.

The results obtained by vaccine therapy in the treatment of puerperal septicemia are particularly gratifying, especially in the 18 cases reported by Hartwell, Streeter, and Green, in which every case recovered. No less remarkable is the series of 47 cases treated by Leary, in which there were only four deaths. Leary states that in most of these cases vaccine therapy was only used as a last resort, and 2 of the cases were moribund when treatment was begun. Martyn's case had received three doses of antistreptococcic serum without the slightest effect before vaccine treatment was adopted, after which improvement took place rapidly.

TYPHOID FEVER.

Prophylactic Inoculations.

		Cases of typhoid.	Cases per 10,000	Deaths of typhoid.	Deaths per 10,000.
McRae,[54] Boer War (1899 to 1902):					
Not inoculated	150,231	3739	242	257	17.1
Inoculated	19,069	226	118	39	20.0
Kuhn,[67] German South African Troops (1902–1906):					
Not inoculated	9209	906	980	116	120.0
Inoculated	7287	371	500	24	33.0
Leischman,[73] British Colonal Army (to June, 1908).					
Not inoculated	6610	187	283	26	39.3
Inoculated	5473	21	38	2	3.6

The earlier prophylactic inoculations against typhoid fever do not present anything very striking; indeed, while the incidence of attack seems to be reduced, the death rate is slightly higher. However, the inoculation of the German South African troops gave better results, and Leischman's report of the British Colonial Army are very encouraging. Russell[113] has inoculated 1400 American soldiers, and Hartsock[56] 563. It is too early to learn anything of the results of these inoculations as yet.

Typhoid Fever.

Authors.	Cases.	Results.
Richardson,[103]	40	5 per cent. relapsed; 163 cases not inoculated, 21.4 per cent. relapsed.
Illman[66]	1	Not benefited.
Watters[128]	30	Had mild course. One case not benefited.
Watters[129]	4	Had mild course.
Smallman[122]	36	Generally a mild course. Three deaths.
Semple[119]	9	Generally a mild and short course. All recovered.
Nichols[95]	11	Generally mild; no deaths; 2 relapses.
Richardson[104]	28	Only one relapsed.
Raw[102]	9	No marked effect; 2 died.
		Carrier Cases.
Irwin & Houston[69]	1	Cured.
Houston[65]	3	Two cured; one markedly improved.
	172	

The treatment of typhoid fever by bacterial vaccines has not met with very marked success as yet, and the results claimed by various authors are at variance. Richardson has not noted any marked improvement due to the treatment, but thinks that relapses are largely prevented. Other observers do not note this fact, but are of the opinion that when treated with vaccines the disease has a much milder course. In the 34 cases treated by Watters and Eaton, the temperature became normal in 1 case on the eighth day, in 1 on the eleventh, 1 on the twelfth, 1 on the fourteenth, 2 on the sixteenth, 2 on the seventeenth, 3 on the eighteenth, 1 on the twentieth, 2 on the twenty-first, 4 on the twenty-second, 1 on the twenty-fourth, 1 on the twenty-sixth, 1 one on the twenty-seventh, and 2 on the twenty-eighth day of the disease. Two of the cases that reached normal on the seventeenth day had relapses, and one of the cases did not respond to treatment at all. These authors compare the death rate of 31 cases treated with vaccines to that of 46 other cases that received routine treatment only. In the former the death rate was 3.2 per cent., while in the latter it was 11.1 per cent. Two of the cases treated by Semple with autogenous vaccines had normal temperatures on the eighteenth and nineteenth days, respectively.

In the treatment of carrier cases of typhoid fever, vaccine therapy may prove of untold value, if further investigations give results similar to the ones tabulated. The case reported by Irwin and Houston occurred in a domestic who had had typhoid fever seven years previously. In the interval six people in families in which she worked contracted typhoid fever. An examination of her stools and urine revealed the presence of many typhoid bacilli in the latter. She was treated with urinary antiseptics, tonics, and rest for five weeks, at the end of which time the bacilli were still present in the urine. An autogenous vaccine was prepared, and after the fourth injection the organisms disappeared from the urine. Three subsequent examinations of the stools and urine were negative, and a marked improvement in the general health of the patient resulted.

DISEASES OF THE DIGESTIVE TRACT.

Pyorrhœa Alveolaris.

Authors.	Cases.	Cured.	Improved.	Remarks.
Carmalt-Jones[55]	5	2	1	One not benefited.
Goadby[46]	2	2	0	
Beebe[6]	17	6	11	
Goadby[46]	51	36	9	Four not benefited.
Fisher[39]	1	0	1	
	76	46	22	5 not benefited.

One of the cases of Carmalt-Jones and Humphreys discontinued treatment, and 2 of Goadby's cases died of intercurrent diseases.

Cancrum Oris.

Mallanah[88] reports a case of cancrum oris from which Staphylococcus aureus was isolated. A vaccine was administered and a cure resulted.

Cholecystitis.

Wright and Reid[150] report 2 cases of cholecystitis treated with vaccines, both of which were cured. One case was that of obstructed jaundice, which was not relieved by operation, and the bile was discharged through a sinus. Bacillus coli was isolated from the bile, a vaccine prepared, and after three injections the sinus closed and the jaundice cleared up, resulting in a complete cure. The second case was one in which fourteen stones had been removed from the gall-bladder two months previously; the sinus remained open and the patient did not improve. Under vaccine treatment the sinus closed and the patient made a somewhat slow but complete recovery.

In a case reported by Turton and Parkin,[134] the patient had been ill three weeks with gradual loss of flesh, abdominal pain, rigors, and at intervals swelling of the epigastrium. He was operated on for pancreatic disease, but the pancreas was found to be normal and a large stone was removed from the gall-bladder. The rigors continued, and the patient was sent home to die. Examination of the gall-bladder secretions gave a pure culture of Bacillus coli. A vaccine was made and 500,000,000 inoculated. This was followed by one rigor three days after the inoculation. Two more injections were given, and the patient made a rapid and complete recovery.

Ulcerative Colitis.

White and Eyre[142] report 3 cases of ulcerative colitis treated with a vaccine made from the colon bacillus, which had been isolated from the intestine. All three cases were cured.

Tuberculous Enteritis.

Turton and Parkin[134] treated 2 cases of tuberculous enteritis with tuberculin, both cases showing marked improvement. One case of tuberculous enteritis treated by Thomas[128] died.

Gastritis.

White and Eyre[142] report a case of gastritis occurring in a female, aged thirty-six years, who for over eight months had had nausea, heartburn, chilliness, slight rise in temperature, and who had a severe feeling of illness and was completely incapacitated. During the attacks she was constipated and had lost much flesh. Different physicians had diagnosed duodenal ulcer and atonic dilatation of the stomach. Stomach washings contained many colon bacilli, from which a vaccine was prepared and administered. After the first injection the patient showed improvement, and after five months' treatment she had gained fifteen and one-half pounds in weight; her appetite was good, and she felt perfectly well. When seen seven months later she was doing well and had no further attacks.

Peritonitis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Turton[134]	1	1	0	
Beebe[7]	1	1	0	
Illman[66]	2	1	0	One not benefited.
Robinson[117]	1	1	0	
Wolfsohn[146]	1	0	1	
Fisher[39]	1	0	0	One not benefited.
	7	4	1	2 not benefited.

The cases reported by Illman and Duncan and by Wolfsohn were tuberculous peritonitis. Those reported by Beebe and Medalia, Turton and Parkin, and Fisher, were due to the colon bacillus, and the case of Robinson was due to the pneumococcus.

Gonorrhœal Proctitis.

Illman and Duncan[66] report a case of gonorrhœal proctitis successfully treated with gonococcic vaccine.

DISEASES OF THE RESPIRATORY SYSTEM.

Bronchiectasis.

McDonald[83] reports 3 cases of bronchiectasis treated with vaccines, one of which was cured. The other two were not benefited.

Bronchial Asthma.

Authors.	Cases.	Cured.	Improved.	
Briscoe[14]	1	1	0	
Harris[55]	1	0	1	
Allen[2]	1	1	0	
Carmalt Jones[34]	52	0	48	Four not benefited.
Fisher[39]	1	1	0	
	56	3	49	4 not benefited.

The vaccine used by Carmalt-Jones was made from an unknown organism isolated from a case of bronchial asthma. Thirty-one of these cases have found some degree of improvement in the frequency, and 39 in the severity of the attacks; 26 have improved in their power of taking exercise, and 29 have slept better. The cases of Briscoe and Williams and of Fisher were treated with a vaccine made from the staphylococcus and influenza bacillus; that of Harris by a vaccine made from Micrococcus catarrhalis and the pneumococcus; and that of Allen by a mixed vaccine.

Pneumonia.

Authors.	Cases.	Results.
Wolf[146]	14	Eleven recovered; 40 per cent. of deaths in untreated.
Boellke[13]	13	All cured; three days average duration after inoculation.
Leary[77]	83	Seventy-one recovered.
Batten[5]	1	Cured.
Harris[55]	7	Four had crisis on average twelve hours; three not benefited.
Allen[2]	1	Delayed resolution. Cured.
Willcox[141]	24	Twenty-three cured.
Graig[32]	6	All cured.
Fisher[39]	6	Five cured.
	155	135 recovered.

MacDonald,[86] working in the bacteriological department of the London Hospital, laid the foundation for the vaccine treatment of pneumonia by producing artificial crises in rabbits infected with the pneumococcus. These infected animals were inoculated with a vaccine made from the same strain with which they had been infected, and he was able to produce a crisis and recovery at will. Rabbits used as controls on which the vaccines were not used, died.

The death rate from pneumonia varies under different conditions, and is estimated at from 25 per cent. to 60 per cent. In an analysis of 43,455 cases, Musser and Norris[94] found an average mortality of 21.06 per cent. The average mortality in this series of 155 cases is 12.9 per cent.

In the 14 cases treated by Wolf, the death rate was 27.2 per cent., while in other cases of the same epidemic that did not receive vaccine treatment, the death rate was 40 per cent. The crisis occurred in thirty-six hours after inoculation in ten of the eleven patients that recovered.

In Leary's 83 cases, 34 occurred in alcoholics, a class of patients in which the death rate in pneumonia is unusually high, averaging about 50 per cent. Of these 34 cases, 6 died, a mortality of 17.7 per cent. Of the other 49 cases, only 2 died, a death rate of 4.08 per cent., or a total mortality for the entire series of 83 cases of 9.7 per cent.

Of particular interest is the series of cases treated by Craig. These 6 cases occurred in the Sailor's Snug Harbor Hospital, New Brighton, where the inmates are all over sixty years of age, and where the mortality rate from pneumonia has averaged 66.6 per cent. during the past four years. The patients were aged sixty-six years, sixty-seven, seventy-three, seventy-five years and five months, eighty, and eighty-three years old, respectively. Three of the patients were alcoholics, and 2 of the cases followed an alcoholic debauch. Five had chronic nephritis, and all had marked arteriosclerosis. All the cases were treated with vaccines, and all recovered.

Empyema.

Authors	Cases.	Cured.	Improved.	Remarks.
Lyon[81]	1	1	0	
Ohlmacher[99]	1	1	0	
Ross[111]	1	1	0	
Ross[110]	1	1	0	
Boellke[13]	1	1	0	
Western[141]	2	2	0	
Briscoe[14]	2	0	1	One not benefited.
Floyd[41]	3	3	0	
Beebe[7]	3	1	2	
Harris[55]	1	1	0	
White[142]	3	2	0	One not benefited.
Hartwell[50]	6	0	0	Not much benefited.
Hoobler[62]	1	1	0	
Thomas[128]	2	1	1	
	28	16	4	8 not benefited.

A large number of this series were cases in which the condition and persisted for some time, with little or no improvement, and vaccine therapy was only administered as a last resort. The case of Lyon is worthy of note, because of the almost remarkable results achieved. Resection of the rib was followed by a chronic discharge of about half an ounce of pus daily, which continued without any signs of improvement for nine weeks. At this time an autogenous pneumococcic vaccine was administered; the patient began to improve at once, and fourteen days after the first inoculation was able to return to work.

DISEASES OF THE CIRCULATORY SYSTEM.

Acute Ulcerative Endocarditis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Barr[4]	1	1	0	
Wright[149]	6	2	1	Three not benefited.
Ross[111]	1	1	0	
Western[141]	2	0	0	Not benefited.
Boellke[13]	1	1	0	
Horder[64]	4	2	0	Two not benefited.
Ladd[75]	2	0	2	
Conders[31]	1	1	0	
Thompson[129]	7	3	4	
Hoobler[63]	1	0	1	
	26	11	8	7 not benefited.

Of the above series of 26 cases, 22 were due to the streptococcus, 2 were due to the pneumococcus, and 2 were due to the influenza bacillus. The case reported by Barr, Bell, and Douglas had received five doses of antistreptococcic serum without effect. On the thirty-ninth day of the disease the patient received an autogenous streptococcic vaccine, and marked improvement followed immediately. Thompson states that in his 7 cases the administration of an autogenous vaccine never failed to produce some improvement, such as a fall in temperature or other indication of benefit

DISEASES OF THE DUCTLESS GLANDS.

Adenitis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Ohlmacher[99]	1	1	0	
Strubell[126]	1	0	0	Not benefited.
Sherman[120]	1	1	0	
Tuberculous.				
Turton[134]	8	1	6	One not benefited.
Ross[110]	2	1	1	
Painter[103]	2	0	0	Not benefited.
McArthurs[62]	2	0	2	
Ross[111]	2	2	0	
Western[141]	5	4	0	One not benefited.
Beebe[7]	4	2	2	
Illman[66]	2	2	0	
Grant[48]	1	1	0	
Turton[133]	10	8	2	
Carmalt[22]	79	27	30	Twelve not benefited.
Miller[92]	2	1	1	
	122	51	44	17 not benefited.

The cases of acute adenitis are too few to form any judgment as to the value of vaccine treatment in this condition. Tuberculous

adenitis is usually benefited by the administration of tuberculin, and many surgical operations are rendered unnecessary. This is especially true of those cases treated before caseation occurs, in which, as a rule, a cure is effected. Caseated masses and abscesses should be treated both surgically and by vaccines. When sinuses have formed, mixed vaccines should be employed.

DISEASES OF THE GENITO-URINARY SYSTEM.

Acute Nephritis.

White and Eyre[142] report a case of acute nephritis which was treated with a mixed Staphylococcus aureus and Bacillus colon vaccine with success.

Tuberculosis of the Kidney.

Authors.	Cases.	Cured.	Improved.	Remarks.
Turton[134]	2	0	2	
McArthur[82]	2	2	0	
Walker[137]	1	0	1	
Turton[139]	4	0	3	One not benefited.
Carmalt-Jones[23]	8	2	5	One not benefited.
Miller[93]	2	1	1	
	19	5	12	2 not benefited.

The results obtained in tuberculosis of the kidney are encouraging, and it would seem that at least tuberculin should be employed in those cases in which, for any reason, operation is contraindicated, or in the cases that refuse operation.

Pyelonephritis.

Routh[114] reports a case of pyelonephritis of pregnancy from which the colon bacillus was isolated. A vaccine was made and administered, and a cure resulted. Hartwell and Streeter[59] also report a case of pyelonephritis treated with a colon vaccine with improvement.

Pyelitis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Hicks[61]	1	1	0	
White[142]	2	1	0	One not benefited.
Cunningham[26]	2	1	1	
Hartwell[59]	6	2	2	Two not benefited.
Fisher[39]	1	1	0	
Billings[12]	2	2	0	
	14	8	3	3 not benefited.

All of the above 14 cases were due to the colon bacillus except 1 of the 2 cases reported by Cunningham, which was a mixed colon and tuberculous infection. This case was improved.

Cystitis.

Unclassified

Authors.	Cases.	Cured.	Improved.	Remarks.
Floyd[41]	1	1	0	Uro-bacillus infection.
Miller[81]	1	1	1	Friedlander's bac. infection.
Wolfsohn[1]	1	0	1	Bacillus fluorescens infection.
Hartwell[60]	6	4	0	Mixed infections. Two not benefited.

Tuberculous Infections.

Ohlmacher[99]	1	0	1	
Ross[110]	1	1	0	
Ross[111]	1	1	0	
Walker[127]	1	1	0	
Carmalt-Jones[22]	17	2	12	Three not benefited.

Colon Infections.

Ohlmacher[99]	1	1	0	
Western[141]	2	1	1	
Rodd[103]	2	1	1	
McArthur[82]	2	0	2	
Floyd[41]	2	2	0	
Beebe[7]	3	1	2	
Illman[76]	1	1	0	
Clark[28]	1	1	0	
Turton[133]	1	1	0	
White[142]	5	4	0	One not benefited
Thomas[128]	1	0	1	
Wulff[141]	21	18	0	Three not much improved.
Hartwell[60]	5	1	4	
McDonald[83]	4	3	0	One not benefited.
Billings[12]	2	2	0	
	83	47	26	10 not benefited.

The results in the treatment of cystitis with vaccine are very good, especially the colon infections, in which the good effects are usually early apparent and well marked, frequent urination and pain disappearing quickly. The complete disappearance of the organisms from the urine, however, often requires rather long treatment.

Urethrocystitis.

Ballenger[3] reports 3 cases of gonorrhœal urethrocystitis treated with gonococcic vaccine with much benefit.

Epididymitis.

Authors.	Cases.	Cured.	Improved.	Remarks
Ohlmacher[99]	2	1	1	
Ballenger[3]	2	0	2	
Jamieson[72]	1	1	0	
Walker[127]	1	0	1	
	6	2	4	

The case reported by Walker was tuberculous epididymitis. The other 5 cases were due to the gonococcus. The number of cases is

too few to form any opinion of the value of vaccines in these conditions, but Belfield,[10] while not citing any cases in summing up the treatment of "Pus Tubes in the Male," states: "Vaccine therapy, accurately applied, is the most valuable internal measure against the infections which produce pus tubes in the male."

Orchitis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Eyre[38]	3	3	0	
Wolfsohn[146]	1	1	0	
Carmalt-Jones[72]	8	3	4	One not benefited.
	12	7	4	1 not benefited.

The 3 cases reported by Eyre and Stewart were due to the gonococcus. The remaining 9 cases were tuberculous.

Prostatitis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Bellenger[3]	10	0	10	
Robertson[105]	6	6	0	
Rooker[109]	1	1	0	
Thomas[128]	1	0	1	
	18	7	11	

Four of the cases of the above series were acute, and the remaining cases were chronic prostatitis. Of the acute cases, 1 was cured and the remainder benefited by the use of vaccines. Six of the chronic cases were cured and the remaining 8 were improved. The acute case reported by Rooker was due to Staphylococcus aureus, and was cured by the use of a vaccine made from this organism. The remaining 17 cases were gonorrhœal. The 6 cases reported by Robertson were chronic cases following gonorrhœa. They were not relieved by routine treatment nor by the inoculation of gonococcic vaccines. The injection of a vaccine made from Staphylococcus albus resulted in a cure of all of the cases.

Urethritis (Gonorrhœal).

Authors.	Cases.	Cured.	Improved.	Remarks.
Acute.				
McArthurs[82]	2	0	1	One not benefited.
Eyre[38]	14	10	4	
Chronic.				
French[42]	2	2	0	
Ohlmacher[99]	2	0	2	
McArthurs[82]	11	0	7	Four not benefited.
Illman[56]	1	1	0	
Eyre[38]	5	2	3	
Loxton[80]	3	3	0	
Thomas[128]	1	1	0	
Lake[76]	1	0	0	Not benefited.
McDonald[83]	6	0	0	Not benefited.
Miller[92]	3	3	0	
	51	22	17	12 not benefited.

Vaccines should be tried in this condition, particularly in chronic cases, which, as a general rule, resist all other forms of treatment.

Urethral Stricture.

Ballenger[3] has reported 3 cases of urethral stricture, due to the gonococcus, which were benefited by the administration of a vaccine.

Salpingitis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Tuttle[125]	1	1	0	
Fisher[29]	2	2	0	
	3	3	0	

The case reported by Tuttle was gonorrhœal salpingitis, while the 2 cases reported by Fisher were the ordinary pyosalpinx.

Septic Endometritis.

Oastler[96] reports a case of septic endometritis in which Streptococcus pyogenes and Bacillus colon were isolated from the uterus. The administration of a vaccine made from these organisms resulted in marked improvement in the condition.

Vaginitis (Specific in Children).

Authors.	Cases.	Cured.	Improved.	Remarks.
Ohlmacher[77]	2	2	0	
Butler[20]	12	10	2	
Hamilton[53]	67	0	61	One not benefited.
Churchill[17]	17	10	7	
Butler[22]	25	0	25	
Ladd and Russ[75]	3	2	1	
Thomas[128]	1	0	1	
Hamilton[52]	84	76	0	Five not cured: three lost.
	211	100	103	6 not benefited.

In the first series of 12 cases treated by Butler and Long, the average duration of treatment was forty-three days. Ten of the cases were cured and 2 improved. Of 12 other cases studied at the same time, that were receiving routine treatment, only 3 were cured, on an average of fifty-one days for the series of cases. In the cases studied by Hamilton and Cooke, 11 were acute. Of 7 of these cases treated by vaccines, 4 improved rapidly, 2 improved slowly, and 1 was not benefited. They found that in the 4 cases not treated, 2 were benefited and 2 did not improve. They conclude that vaccine treatment has advantages over routine treatment. In 10 cases, both routine and vaccine treatment were used. There was no advantage noted over the cases receiving vaccine treatment alone. They call attention to the fact that while vaccine treatment can be administered in

the home by the physician, routine treatment can only be used in hospitals, and even here there is always danger of mechanical injuries, or even peritonitis, being produced. The prolonged use of the douche in the treatment of cases of this character may also induce the habit of masturbation, and Hamilton and Cooke cite the case of three little girls who were incorrigible masturbators as long as vaginal douches were given, but when the douches were stopped and vaccine treatment begun, the girls ceased the habit. Churchill and Soper had an average of only nineteen days' duration in the treatment of their series of 17 cases. In the second series of 25 cases treated by Butler and Long, the average duration of treatment was forty-three days. Thirteen of these cases were chronic, 11 of which recovered, with an average duration of treatment of thirty-nine days. Hamilton gives the following table showing the results obtained by vaccine treatment compared with irrigation methods:

Treatment.	Cases.	Cured.	Not cured.	Lost.	Per cent. cured.
Irrigation	260	158	53	49	60 per cent.
Vaccine	84	76	5	3	90 per cent.

Average length of time under active treatment by the irrigation method, 10.1 months.

Average length of time under active treatment by the vaccine method, 1.7 months.

DISEASES OF THE SKIN AND ITS APPENDAGES.

Acne.

Authors.	Cases	Cured.	Improved.	Remarks.
Wright[146]	3	1	2	
Bulloch[20]	5	5	0	
Ohlmacher[99]	2	1	1	
Turton[134]	2	2	0	
Ross[110]	2	2	0	
Varney[136]	9	6	2	One discontinued treatment.
Ross[111]	5	5	0	
McArthurs[82]	2	1	1	
Western[141]	12	12	0	
Schamberg[115]	7	1	3	Three not benefited.
Floyd[41]	2	2	0	
Illman[66]	4	3	0	One not benefited.
Ridlon[105]	1	1	0	
Miller[91]	3	2	1	
Turton[133]	8	3	5	
Strubell[127]	9	4	4	One still under treatment.
Ladd and Russ[75]	28	6	14	Two not benefited; 6 discontinued treatment.
Wolfsohn[146]	1	1	0	
Fleming[40]	3	3	0	
White and Eyre[142]	1	1	0	
Beggs[9]	2	1	1	
Thomas[128]	5	2	3	
McDonald[83]	19	7	10	Two not benefited
Fisher[39]	4	2	1	One not benefited.
	139	74	48	9 not benefited.

Fleming treated his 3 cases with a mixed vaccine of Staphylococcus albus and Bacillus acne. This author claims that while the staphylococci are always associated with the pustular lesions of this disease, the acne bacillus is the true etiological factor, and in order to produce an immunity to the disease, vaccines of both organisms must be used.

Carbuncles.

Authors.	Cases.	Cured.	Improved.	Remarks.
Hartwell[56]	1	1	0	
Western[141]	2	2	0	
Floyd[61]	1	1	0	
Strubell[127]	1	1	0	
Wolfsohn[146]	1	1	0	
Turton[132]	1	1	0	
Mallanah[88]	2	2	0	
Thomas[128]	7	6	1	
McDonald[83]	3	3	0	
Miller[92]	1	1	0	
Fisher[39]	4	4	0	
	24	23	1	

While the number of cases is small, the results achieved with bacterial vaccines in carbuncles is rather remarkable.

Eczema.

Authors.	Cases.	Cured.	Improved.
Schamberg[115]	1	0	1
Floyd[61]	1	0	1
Crofton[28]	1	0	1
Miller[91]	1	0	1
McDonald[83]	3	3	0
	7	3	4

As to just what role bacteria play in the etiology of eczema dermatologists do not agree. Gilchrist and many other authorities are inclined to think that as the primary factor they are of not much importance. It is agreed, however, that secondary infections are extremely common, and it is probable that it is in these secondary conditions that vaccines may be of use.

Erysipelas.

Authors.	Cases.	Cured.	Improved.	Remarks.
Schrorer[116]	37	37	0	Two had relapse.
Harris[54]	1	1	0	
Illman[68]	2	1	0	One not benefited.
Ross[112]	19	19	0	
McDonald[83]	9	8	0	One died.
Thomas[128]	2	1	1	
Hoobler[63]	1	1	0	
	71	68	1	2 not benefited.

Schorer is of the opinion that the use of vaccines in erysipelas shortens the duration of the disease somewhat. Ross and Johnson compare the results obtained in 19 cases treated with vaccines to the results obtained in 19 cases treated the year previously by internal and external applications. The following table gives the comparison.

	Treated by vaccines.	Routine treatment.
Pyrexia completed in twenty-four hours	7	3
Pyrexia completed in forty-eight hours	7	3
Pyrexia completed after forty-eight hours	5	13
Average duration of pyrexia	3.1 days.	8.9 days.
Complications	1	6
Average duration of illness	12.8 days.	25 days.
Average stay in hospital	11.2 days.	18 days.

Furunculosis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Wright[147]	6	6	0	One case relapsed.
Wright[148]	6	3	2	One not benefited.
Bulloch[20]	4	4	0	
Ohlmacher[99]	3	1	2	
Turton[134]	3	2	1	
Ross[110]	1	1	0	
Thorne[130]	1	1	0	Three years' duration.
Hartwell[58]	3	3	0	
Varney[136]	5	5	0	
Ross[111]	11	9	2	
McArthurs[92]	3	3	0	
Western[141]	9	9	0	
Schamberg[115]	3	1	2	
Floyd[41]	1	1	0	
Beebe[7]	3	3	0	
Bristow[18]	1	1	0	
Illman[68]	1	1	0	
Britenstool[17]	3	3	0	
Whitmore[143]	1	1	0	
Strubell[126]	12	10	1	One not benefited.
Ladd[75]	7	7	0	
Wolfsohn[146]	5	3	1	One not benefited.
White and Eyre[142]	1	1	0	
Turton[133]	1	0	1	
Hoobler[62]	2	2	0	
Mallanah[85]	2	2	0	
Rooker[109]	2	2	0	
Beggs[9]	12	12	0	
Thomas[128]	6	6	0	
McDonald[83]	14	14	0	
Fisher[39]	3	3	0	
Miller[92]	3	3	0	
Strubell[127]	2	2	0	
	140	125	12	3 not benefited.

That vaccines are of benefit in this condition there can be no doubt, and while there is a very small percentage of cases that for some unknown reason do not react, it is probable that no other method of treatment will accomplish the same satisfactory results. Even with vaccine treatment, however, a very small percentage of the cases relapse.

Impetigo.

Ohlmacher[99] reports 2 cases of impetigo cured with autogenous vaccines.

Lupus.

Authors.	Cases.	Cured.	Improved.	Remarks.
Ross[110]	2	1	1	
Turton[134]	2	0	2	
Western[141]	11	6	4	One not benefited.
Todd and Western[131]	5	1	3	One not benefited.
Richardson[108]	1	0	1	
Turton[133]	3	0	1	Two not benefited.
Carmalt-Jones[23]	23	3	17	Three not benefited.
	47	11	29	7 not benefited.

Psoriasis.

Two cases of psoriasis treated by bacterial vaccines have been found in the literature; 1 case reported by Ohlmacher was cured, and the other case, reported by Schamberg, Gildersleeve, and Shoemaker,[115] was not benefited.

Dandruff.

Fisher[39] reports improvement in 2 cases of dandruff treated with a vaccine made from Staphylococcus albus.

Sycosis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Wright[145]	3	3	0	
Bulloch[20]	2	1	0	One not benefited.
Turton[134]	1	1	0	
Varney[135]	2	1	0	One discontinued treatment.
Ross[111]	1	0	1	
Schamberg[116]	9	1	6	Two not benefited.
Crofton[32]	1	1	0	
Grant[46]	1	1	0	
Turton[133]	1	0	1	Relapsed.
Strubell[138]	1	0	1	
Ladd and Russ[75]	2	0	1	One not benefited.
McDonald[84]	4	4	0	
	28	13	10	4 not benefited.

In sycosis, good results are the rule, although sometimes the treatment requires a considerable period of time.

DISEASES OF THE BONES AND JOINTS.

Arthritis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Painter[100]	6	0	0	None of the cases benefited.
Sherman[120]	5	4	1	
Thomas[125]	3	0	0	Not benefited.
	14	4	1	9 not benefited.

The treatment of arthritis with bacterial vaccines can never be successful until the true cause of the disease is determined. Painter treated his 6 cases with vaccines made from the streptococcus, the streptococcus and Schuler's bacillus, the streptococcus, staphylococcus, and Schuler's bacillus, and Schuler's bacillus and the pneumococcus. His results were negative in all cases. Sherman's series includes 3 acute, 1 subacute, and 1 chronic case of arthritis. All were treated with a special streptococcic stock vaccine. The chronic case was improved and the remaining cases cured. In the 3 cases reported by Thomas, Staphylococcus aureus was the infecting organism in 1 case, Staphylococcus albus in 1, and a mixture of the two in the other case. Vaccines made from these organisms were of no benefit.

Gonorrhœal Arthritis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Ohlmacher[99]	2	1	1	
Cole and Meakins[79]	15	10	5	
McArthurs[82]	1	1	0	
Bristow[15]	1	1	0	
Irons[67]	31	18	9	Four not benefited.
Illman[66]	2	2	0	
Whitemore[142]	1	1	0	
Mainini[87]	4	0	4	
Ladd and Russ[75]	11	0	11	
Maute[90]	4	4	0	
Oastler[96]	1	1	0	
Dieulafoy[36]	18	7	8	Three not benefited.
White and Eyre[140]	4	4	0	
Eyre and Stewart[58]	26	18	8	
Thomas[125]	4	2	2	
Hartwell[57]	51	0	42	Nine not benefited.
McDonald[83]	14	9	1	Four not benefited.
Jack[70]	4	4	0	
Miller[93]	1	1	0	
	195	84	91	20 not benefited.

In gonorrhœal arthritis the results are usually good, but here also a certain number of cases fail to respond to the treatment. The immunity, however, is of short duration, as would be expected from a study of other gonorrhœal infections, and relapses are apt to occur, especially if a fresh infection of the urethra is contracted.

Rheumatoid Arthritis.

White and Eyre[142] have treated 1 case of rheumatoid arthritis with Staphylococcus aureus vaccine and report improvement.

Osteomyelitis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Illman and Duncan[66]	1	0	1	
Hartwell[60]	4	0	0	Not much benefited.
Wolfsohn[146]	3	0	0	Not benefiited.
Thomas[128]	2	0	1	One not benefited.
	10	0	2	8 not benefited.

Osteoperiostitis.

Thomas[128] reports a case of gonorrhœal osteoperiostitis treated with gonococcic vaccine with improvement.

Tuberculosis of Bones and Joints.

Authors.	Cases.	Cured.	Improved.	Remarks.
Turton[134]	1	0	0	Not benefited.
Painter[100]	7	0	3	Four not benefited.
McArthur[93]	19	1	15	Three not benefited.
Ogilvy[93]	5	0	4	One not benefited.
Illman[66]	8	2	3	Three not benefited.
Crofton[22]	1	1	0	
Turton[133]	5	0	2	Three not benefited.
Smith[124]	34	11	19	Three not benefited.
Thomas[128]	20	0	15	Five not benefited.
	100	15	61	23 not benefited.

This series of cases includes Pott's disease, tuberculosis of the hip-joint and other bones and joints.

DISEASES OF THE NOSE AND THROAT.

Coryza.

Authors.	Cases.	Cured.	Improved.	Remarks.
Harris[55]	1	1	0	
Benham[11]	5	0	5	
	6	1	5	

The case reported by Harris was treated with a vaccine made from Micrococcus catarrhalis. Benham treated his case with a mixed vaccine made from Micrococcus catarrhalis and Micrococcus paratetragenus.

Hay Fever.

Fisher[39] has successfully treated a case of hay fever with a vaccine made from Staphylococcus albus.

Influenza.

Fisher[39] reports a case of influenza treated with success with an autogenous vaccine made from the influenza bacillus and the pneumococcus.

Atrophic Rhinitis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Skillern[122]	2	0	2	
Mosher and Kerr[52]	10	0	10	
Fisher[39]	1	0	1	
	13	0	13	

The cases of Skillern and Burvill-Holmes were treated with a vaccine made from Bacillus mucosæ. The 10 cases of Mosher and Kerr were treated with a mixed vaccine of Staphylococcus aureus, albus, and citreus. These authors state that improvement was noted in all cases, and particularly in the bad ones. The headache, the odor, the large crusts, the dryness of the throat, were improved in all cases, and in many of them cured. Fisher's case was treated by a vaccine made from Staphylococcus citreus.

Tuberculous Laryngitis.

Illman and Duncan[66] report a case of tuberculosis of the larynx treated with tuberculin with improvement. Two cases treated by Carmalt-Jones[23] were not benefited.

Sinusitis.

Beck[8] treated 3 cases of sinusitis, 1 an acute unilateral, 1 a subacute unilateral, and 1 a chronic polysinusitis with staphylococcic vaccine. All 3 cases were improved.

DISEASES OF THE EYE AND EAR.

Gonorrhœal Conjunctivitis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Ohlmacher[29]	3	2	1	
Eyre and Stewart[35]	1	0	0	Not benefited.
Miller[92]	2	2	0	
	6	4	1	1 not benefited.

Corneal Ulcer.

Allen[1] reports 2 cases of corneal ulcer from which the pneumococcus was isolated in 1 case and a small unknown micrococcus in the second. Vaccines were made from the respective organisms and cures occurred in both cases.

Hypopyon.

Allen[1] treated 3 cases of hypopyon with autogenous pneumococcic vaccines. Two of the cases were cured and the other improved.

Iritis.

Gonorrhœal.

Authors.	Cases.	Cured.	Improved.	Remarks.
Eyre and Stewart[38]	4	3	1	
Miller[92]	1	1	0	
Shumway[121]	1	1	0	

Tuberculous.

Ross[110]	1	0	1
Ross[111]	1	0	1
	8	5	3

Phlyctenular Infections.

Gradle[47] reports 9 cases of phlyctenular infections due to staphylococci. Staphylococcic vaccines gave satisfactory results in the treatment of all 9 cases.

Mastoiditis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Conners[30]	3	0	2	One not benefited.
Hoobler[62]	1	1	0	
Scott[118]	1	1	0	
	5	2	2	1 not benefited.

Otitis Media.

Authors.	Cases.	Cured.	Improved.	Remarks.
Beck[3]	4	0	4	
Todd and Western[121]	3	1	2	
Trimble[122]	4	4	0	
Conners[30]	7	2	3	Two not benefited.
Hoobler[62]	2	2	0	
Mallanah[88]	1	1	0	
McWaters[85]	1	1	0	
Thomas[128]	1	0	0	Not benefited.
Jacobs[71]	6	2	4	
Christie[26]	6	6	0	
McDonald[82]	3	2	0	One not benefited.
	38	21	13	4 not benefited.

The 3 cases reported by Todd and Western were mixed tuberculous and staphylococcic infections. The case reported by Mallanah was due to Bacillus pyocyaneus. The remaining cases were mixed coccic infections. Conners is not sure that vaccines possess any particular merit over the routine treatment of this condition, and thinks that, while cures occur, prolonged treatment is usually required. He believes, however, they are of value in very obstinate cases, and should be tried when other means fail.

MISCELLANEOUS INFECTIONS.

Local Sepsis.

Authors.	Cases.	Cured.	Improved.	Remarks.
Ohlmacher[99]	2	2	0	
Rodd[108]	1	0	1	
Hartwell[60]	1	1	0	
Gildersleeve[44]	1	1	0	
Beebe[7]	2	1	1	
Ballenger[3]	1	0	1	
Floyd[41]	3	2	1	
Richardson[103]	1	0	0	Not benefited.
Brock[18]	1	1	0	
White and Eyre[143]	5	5	0	
Wolfsohn[146]	3	1	0	Two not benefited.
Hartwell[60]	41	0	41	
Hoobler[63]	2	2	0	
Thomas[128]	18	6	4	Eight not benefited.
McDonald[79]	7	2	3	Two not benefited.
Fisher[39]	17	10	2	Five not benefited.
Strubell[127]	2	0	0	Not benefited.
Sherman[120]	1	1	0	
Turton[133]	2	1	1	
Illman[66]	1	1	0	
Beggs[9]	1	1	0	
Evans[37]	1	1	0	
Tuberculous Infections.				
Carmalt-Jones[23]	50	10	29	Eleven not benefited.
Wolfsohn[146]	1	0	1	
	165	49	85	31 not benefited.

The above series of cases includes such conditions as cellulitis local abscesses, fistulas, sinuses, and other conditions of local infection.

Postoperative Infections.

Authors.	Cases.	Cured.	Improved.	Remarks.
Schottmuller[117]	1	1	0	
Weinstein[140]	4	2	1	One not benefited.
Turton[132]	2	0	2	
Thomas[128]	9	2	4	Three not benefited.
Hartwell[59]	1	1	0	
Hartwell[60]	22	22	0	
	39	28	7	4 not benefited.

Tuberculous Meningitis.

Turton and Parkin[134] report a case of tuberculous meningitis treated with tuberculin without success.

Diabetes Mellitus.

King[73] isolated Saccharomyces cerevisiæ from the blood of 16 diabetic patients. Six of these patients were treated with a vaccine

made from the fungus, with general improvement in their condition. The reduction in the amount of sugar in the urine was not marked, but the acetone and diacetic acid disappeared. King had the patients still under treatment at the time of writing.

Miller[92] reports 4 cases of furunculosis with glycosuria. When the staphylococcic infection was treated with vaccines the glycosuria cleared up.

Lack of Nutrition in Mania.

Bruce[19] has noted that the most common bodily disorder in patients suffering with chronic mania is lack of nutrition. He treated 11 such cases with a polyvalent vaccine made from seven strains of streptococci obtained from the blood, urine, and feces of the patients. Four of the patients recovered from the mania, but what was more surprising, was the improvement of nutrition in 8 of the patients receiving the vaccine. One patient gained twenty-eight pounds in six months, another twenty-six pounds in five months, and there was marked improvement in the nutrition of 6 of the other patients receiving the vaccine.

Not including the prophylactic inoculations, the total number of cases treated by vaccine therapy collected in this series is 2332. Of these, 2000, or 86 per cent., were cured or improved; 251, or 10 per cent., were not benefited; and the remaining 79 cases discontinued treatment, or were lost. Three hundred and six of the cases were general infections, and of these, 274, or 88 per cent., were cured or improved, and 28, or about 9 per cent., not benefited. The series includes sixty-seven different conditions. These figures signify little except in pointing out the tremendous, almost unlimited, field that vaccine therapy may cover. In no instance was serious harm caused by the use of vaccines, although Leary[77] reports 2 cases that, through an error, had received 10,000,000,000 of dead staphylococci at a single dose. One of these cases experienced no ill effects whatever; the second case, however, collapsed a few hours after inoculation, but responded to strychnine and the application of hot water bags, and had practically recovered in fifteen minutes.

It is believed that there are certain factors that might have modified the above results even more favorably had they been followed. Among these may be mentioned:

Uniformity of Doses. It is realized that in order to arrive at just what is the proper dose of dead bacteria to employ in a given condition, it is necessary to study the effect of various sized doses. It is also true that the number of bacteria inoculated at one time depends upon the nature of the disease, whether it is acute or chronic, on the interval between doses, and on the condition of the individual. However, in reviewing the literature, it is often found that one observer treats furunculosis with 10,000,000 dead staphylococci at a dose, while another gives doses of 1,000,000,000; or one author

gives 5,000,000 dead gonococci and another 500,000,000 in an identical condition. The question arises, whether the too large doses may not do harm or the too small ones be of no benefit; at least, it would seem that under the same circumstances, better results might have been obtained had more uniform doses been employed. I have in preparation an analysis of the various doses employed by different observers, and the results achieved, in the hopes of arriving at something near a standard dose of the various organisms.

Intervals between Doses. About the same applies to the intervals between doses as has been described for the size of the doses, both as regards the disease and the condition of the patient. Some authors advise daily injections, while others allow intervals of two weeks, or even a month, between inoculations. Here, too, better results might have been obtained if more uniformity had been followed. Of course, in much of the work done the opsonic index has been used as a guide, but this is subject to such wide variations, that it has only served to complicate matters, and it is now generally believed that the opsonic index is of little value except in the hands of experts.

Stock Vaccines. While stock vaccines are undoubtedly useful in certain conditions, their injudicious use in the hands of careless physicians and unskilled diagnosticians has probably done more to discredit bacterial therapy than any other one thing. The practice of injecting various kinds of dead bacteria or mixtures of vaccines in conditions of obscure etiology in the hope that one or the other may do good, is to be severely condemned.

Preparation of Vaccines. The proper preparation and standardization of a vaccine requires no little skill, and should not be entrusted, as is often done, to internes. Slight errors in standardization are unavoidable, even when carried out by practiced hands, and these errors may assume undesirable proportions in unskilled hands. The methods of killing bacteria are also at variance. Some authorities advise high temperature for short intervals, others low temperatures for long intervals, others low temperatures for short intervals and the addition of antiseptics; and still others, the use of antiseptics alone.

In conclusion, it is suggested that vaccines should only be employed, first, in general infections after blood cultures have been made and the infecting organism identified by an experienced bacteriologist; second, in local infections, in which the organism has been isolated and identified, or in which the symptoms are so marked that a mistake in diagnosis is beyond a possibility.

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MALIGNANT DISEASE AS A PROBLEM OF MODERN SURGERY.[1]

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There seems to be no question among qualified observers that malignant disease in all its forms is gradually becoming more prevalent among the civilized races. Rodman, Billings, and others have collected statistics showing this to be the case in the United States, and the same fact seems to be established as regards Germany, England, and other countries. And more than ever the surgeon is called upon to deal with this scourge of humanity. The time has passed when those whose duty it was to assuage the sufferings of mankind can be idle and allow any form of disease permanently to baffle them. It is but a short time since all but the most superficial and slight forms of malignant disease were regarded as inevitably fatal and, indeed, were hardly given the benefit of any attempt at treatment, unless perhaps we may consider as treatment the relief of pain only.

In all forms of malignant disease we face a pathological process the true significance of which has so far remained beyond our understanding. Bacteriology and pathology, hand in hand, have shown us the cause and nature of pus infections; they have made clear the origin and fundamental process of many of the infectious diseases. Syphilis, whose causative factor was found but five years ago, bids fair soon to be under control. At the same time, preventive medicine has under favorable conditions minimized such diseases as typhoid fever, cholera, and yellow fever. In comparison

[1] Read at a meeting of the New York and New England Railway Surgeons Association, November 3, 1910.

with the great strides which we may observe on every hand in other fields of medical research, we still are well nigh powerless when it comes to malignant tumors.

Let it not be supposed that our efforts have been fruitless. No one who has followed the trend of surgery or of cancer research can fail to be convinced that our investigators are upon the right track and that we must soon emerge from the darkness of comparative ignorance into the light of definite knowledge.

Malignant disease has been known for centuries; it is, as I have said, upon the increase. There is not a community in which it is not present, and every day in one form or another it has its victims. Countless men have labored to discover the cause of this mysterious process, and are still doing so, yet we do not know the etiology of malignant growths.

The theory that perhaps carcinomas and allied growths are due to the development of misplaced embryonal tissues in localities where their growth has made them pathological has been definitely set aside. The transplantations of neoplasms, the apparent infectiousness of certain forms of cancer in fish, and many other pathological facts concerning the dissemination and minute structure of carcinoma renders this view of their origin untenable.

With the rise of bacteriology there came the hope that within the field of simple or even unicellular vegetable organisms we might find the causative factor of malignant processes. A few years ago this, perhaps, was our only hope. It also has failed us. Certain oversanguine investigators have from time to time declared this or that bacterium to be the essential factor in carcinoma. Doyen still asserts that his Micrococcus neoformans "is the specific agent at fault." I am convinced that there is no form of germ life which has as yet in any way been proved to be responsible for any form of malignant growth.

In later years again protozoan diseases came to the forefront. With the spread of civilization and commerce into tropical and semitropical countries it was found that disease about the equatorial regions was largely caused by these forms of animal life, such as trypanosomes. Sleeping sickness, kala-azar, and other diseases were found to be forms of trypanosomiasis. The brilliant investigations of Bruce, Leishmann, Koch, Laveran, and others have placed the study of animal protozoan life on a par with bacteriology. Even before the investigations into the protozoa which affect the human species we were able to discover that the lower animals, rodents, fish, and birds, have many diseases caused by trypanosomes. But there has never been any evidence adduced to encourage the hope that in the domain of protozoa—either trypanosomes or hematocytes—we have the solution of the cancer problem.

There have been certain recent investigations into the carcinomas and sarcomas of the lower animals, particularly of mice,

which have thrown much light upon our conception of both the transmissibility of malignant growths and upon the production of a certain degree of immunity toward malignant processes. They have demonstrated that certain mouse tumors, while not infectious for other species of animal life, can be transplanted almost indefinitely from host to host in the same species. And not only this, but that they generally correctly transmit the characteristics of the original tumor. Moreover, after repeated transference of tumors they seem to lose their virulence, so that spontaneous cure may result, and in such mice there is established an immunity to subsequent inoculations. There has been but one instance in the human being of the use of body fluid from a patient who had apparently had a spontaneous cure of carcinoma. This is the well-known instance reported by the late Dr. Hodenpyl. Perhaps such serum treatment may offer us something of value in the future.

Before leaving the subject of etiology and pathological physiology of malignant growths I wish to call attention to several points. Recent studies upon the thyroid carcinoma of fish have seemed to establish the fact that certain forms of malignant growths in the lower animals may assume more or less epidemic characters. It is true that it has been asserted that the specific tumor mentioned is not a true carcinoma, yet it resembles it sufficiently to be so classed. While it is true that carcinoma is more prevalent in human beings in certain localities and times, nothing has ever shown us that it is directly transmissible in the way that infectious diseases are.

The influence of diet and especially of water in causing malignant growth is as yet not determined; there is some evidence, however, that the specific cause of thyroid carcinoma of trout is always present in certain bodies of water. An interesting fact in this connection mentioned by Gaylord is that puppies brought to such a body of water known to be infected almost without exception develop thyroid enlargement.

The nearest approach to transmission of carcinoma or other malignant growth in the human species we find in the occurrence of chorion epithelioma. This is practically a malignant growth originating by the transplantation of remaining fœtal tissues into the maternal organism, and offers other interesting peculiarities, of which I shall speak later. The following is an example:

Mrs. X., aged twenty-four years, has given birth to one child. Three months after the birth of the child the patient commenced having metrorrhagia, which increased in severity, but without pain. At the time of the operation, curettage was accompanied by such severe hemorrhage that it was deemed best to do vaginal hysterectomy. Pathological examination of the uterus showed chorion epithelioma. The patient is now, four years after operation, entirely well.

Barling has recently reported an instance of spontaneous recovery from chorion epithelioma, ordinarily so virulent.

Heredity was formerly supposed to play an important part in the causation of malignant neoplasms. While I believe that it is undoubtedly true that a patient may have inherited from his ancestors a form of body tissue so vulnerable to malignant invasion that he may be considered predisposed to it, yet I have never seen an undoubted case of inheritance of malignant growth.

Trauma has always been known to play an important part in at least giving rise to a favorable situation for the growth of carcinoma, if not actually causing it. The classical examples of the preponderance of lip epitheliomas in smokers and the infrequency of carcinoma of the cervix uteri in those women who have never borne children (5 per cent. only, Bland-Sutton), are so well known that they need but be mentioned. Abdominal surgery has shown the influence of other than mechanical trauma. Thus, we know that not infrequently carcinoma is implanted upon pyloric ulcer. Mayo has found this change in 54 per cent. of cases, while Moynihan and Fenwick have also called attention to the same feature. There can be no doubt, then, that previous traumatism is in part responsible for the occurrence of malignant tumors.

The most interesting form of malignant growth caused by trauma, other than that of the purely mechanical variety, is the skin carcinoma caused by continued exposure to the *x*-rays. The exact mode or action of the *x*-rays in giving rise to malignant degeneration in skin irritated by the too frequent exposure to the rays has not yet been determined.

Histological studies upon mouse cancer and others have given us an insight into the possible spontaneous cure of carcinoma. They have shown that the growth of a cancer is not, as was formerly supposed, a steadily progressive and irresistible process. In every implanted carcinoma or mixed tumor there is a constant endeavor of the healthy body cells to overcome the newcomer by "fibrous strangulation," as it may be called. The newgrowth, while it becomes vascularized by the promotion of a connective tissue stroma which the host supplies, is, nevertheless, continually attacked. The host attempts to surround and gradually crush the malignant growth. At times the process appears to be entirely successful. The complete encapsulation of malignant emboli within blood-vessels and in the lungs is another evidence that the host is not always losing, but is overcome, so to speak, by successive changes of the malignant growth.

Instances of spontaneous recovery from carcinoma and other malignant growths are not unknown in human beings. The recovery of patients suffering from pyloric growths after exploratory operation occurs at times. Involution of scirrhus of the breast has been observed on numerous occasions.

But perhaps the most encouraging feature of all our experimental and chemical evidence is the undoubted fact that all malignant growths are shown to be purely local processes in their onset. Examination of early carcinomas and sarcomas in human beings—some accidentally discovered after removal of a part at operation—prove that they begin as well-localized foci. The same is true of experimentally produced carcinomas. How important this must be is very evident. If we could happily arrive at a diagnosis before the lesion has spread beyond its limited confines the problem of treatment would take on an entirely different aspect. Surgical interference in the early stages of all but a few inaccessible malignant growths would doubtless cure them all.

In addition, before considering the practical side of the question at issue, I would call attention to the difference in malignancy of growths pathologically similar in corresponding areas in different patients. Spontaneous cure we know is possible. Occasionally we find groups of tumors the microscopic characteristics of which show them to be true carcinomas, yet their clinical course is markedly benign. Carcinoma of the appendix vermiformis belongs to this group. Its location surely would predispose to lymphatic distribution, yet it is almost unknown for one to spread or give rise to metastases.

Granted, then, that carcinoma is at its beginning essentially a localized process, it is evident that early recognition and prompt removal are indicated in every case if possible.

The diagnosis of malignant disease has made considerable strides, yet we are still compelled to rely practically entirely upon clinical findings. The laboratory perhaps enables us to discover earlier evidences of mild anemia than we may appreciate by examination, but there its usefulness ends. Nevertheless, certain cases of carcinoma and sarcoma, even when widely invading important internal structures, do not cause anemia. I have lately operated upon a pyloric carcinoma involving the surrounding tissues to a great extent, in which the hemoglobin was 95 per cent., the red blood cells, 5,000,000. The highest red blood count I have ever observed was in a case of sarcoma of the retroperitoneal glands. There has not yet been discovered any specific serum or hemolytic reaction in patients suffering from cancer. A number have been suggested, but are equal in their lack of true value. The chemistry of the blood, however, is an ever-advancing science, and it is conceivable that some such reaction may in the future be discovered. Since there are so many different varieties of malignant tumors, it seems hardly likely that one reaction would suffice for all of them, even carcinoma, and still less for sarcoma. So far the serum reaction for carcinoma have proved but a false hope, defective and not valuable.

Malignant growths as to diagnosis divide themselves into several

classes. We have always been more easily able to ascertain the true nature of superficial growths, for they are visible and palpable. Two factors, however, enter into consideration here. The first is the varying malignancy of epithelial tumors in different subjects, and the second is the frequent early glandular metastasis in cases which locally show but a slight tendency to spread.

It is in the diagnosis of malignancy within the cavities of the body that we have made most progress, and I can say with assurance that this has been due to the surgeon more than the clinician or pathologist. I have often spoken of "autopsy in vivo," of the investigation of pathological processes which the surgeon can observe during life, whereas they are hidden to the internist. To illustrate my point I need only mention a few concrete examples.

Carcinoma of the stomach was formerly diagnosticated only by three points—cachexia, palpable tumor, and pyloric obstruction. I maintain that none of these are diagnostic symptoms of stomach cancer; they are symptoms of a failure to recognize it early and a reflection upon anyone who waits for their appearance before diagnosticating the condition. Our carefully taken histories of the present day combined with prompt surgical intervention enables us to achieve results which would formerly have been considered impossible.

By careful and persistent comparison of case records with operative findings and postoperative histories, we have come to recognize what might be called the symptom complex of incipient gastric carcinoma.

Occasionally there comes to the hands of the surgeon a case of carcinoma of the stomach in its earliest stages, yet in the vast majority of instances the sufferer from malignant disease has been treated for months for anacidity, dyspepsia, or nervous dyspepsia. The anemia has progressed unnoticed until it is evident that it attracts the patient's own attention. Progressive emaciation has been attributed to lack of nourishment and faulty metabolism. And all the while there has been a picture of progressive tissue change such as only malignant growth could cause.

I am firmly convinced that every case of persistent dyspepsia in persons beyond middle age should at once be studied with reference to the possibility of cancer. Here again our laboratory tests fail us. Examination of the stomach contents in early cases of carcinoma means nothing. Late, indeed, when retention occurs, it shows that the stomach contents are undergoing putrefaction. The Oppler-Boas bacillus, once considered as diagnostic of carcinoma of the stomach, signifies nothing other than the stagnation of the food within the stomach and its fermentative destruction.

The signs of early carcinoma of the stomach, which as we know is generally pyloric or prepyloric in location, are not always clear: far from it. The signs of early upper abdominal disease, whether

of gastric, biliary, or pancreatic origin, are in many ways similar; yet in a patient beyond middle age in whom anorexia and particularly an aversion to meat suddenly begins without apparent cause and insidiously progresses, in whom there is a vague gastric distress, a beginning anemia, and a steady if slight loss in weight, we must always suspect malignant disease. And if the condition does not show marked response to the ordinary hygienic and dietetic measures, the surgeon should be called upon to discover and remedy the fundamental cause of the symptoms.

No one could be more opposed than I to the exploratory operation when this is taken to mean the opening of the abdominal cavity to cover the shortcomings in knowledge of the surgeon. No one is less prone to perform such an operation when it seeks to do away with competent and continued study of a case. Yet there are, and always must be, instances, especially within the range of abdominal conditions, in which we offer the patient a far better chance of recovery by early and perhaps *useless* operation than by delay and *surely* useless operation.

With all our progress in the early diagnosis and earlier treatment of gastric carcinoma, our ultimate results are still most discouraging. How few of our cases come to us early enough to *cure*. How few cases remain well after even our most radical measures. Bloodgood has well said that in malignant disease the clinical diagnosis is difficult in inverse ratio to the duration of the disease. This is particularly true in gastric lesions. We must then of necessity operate in some cases in which our diagnosis is not confirmed if we are to seize upon the favorable moment for any of those in which we have correctly appreciated the lesion present.

In speaking of trauma as a factor in the causation of malignant disease I have mentioned the frequency with which ulcer gives rise to carcinomatous degeneration. Wright has lately emphasized this point. We may almost speak of gastric ulcer when it is chronic and associated with much induration as one of the so-called precancerous states.

The duty of surgery in the prophylactic treatment of cancer should not be lost sight of. Since the role of ulcer in the causation of gastric carcinoma has been clearly demonstrated, who can deny the need of prompt and proper surgical treatment of gastric ulcer? Who can tell how many cases of this disease which have shown temporary improvement under medical treatment have in after years progressed to carcinomatous degeneration at the site of the ulcer? There is in all probability even some chance of the degeneration of a temporarily healed ulcer. There can be no question about the superiority of surgical treatment in its immediate results, and particularly in its prevention of future severe complications.

Carcinoma of the gall-bladder and biliary passages is fortunately

rare, though it is seen occasionally in the course of any extended series of operations upon the biliary tract. In practically every instance it is secondary to the presence of gallstones. In fact, carcinoma of the gall-bladder presents, perhaps, our best example of malignant growth in an internal viscus as a sequel to purely mechanical trauma. Here again the surgeon is often helpless when the condition has been well established, yet is able to remove and cure the possible future cause of carcinoma. The surgical treatment of gallstone disease is cancer prophylaxis in its most evident type.

Along the alimentary tract from the stomach to the rectum carcinoma is not at all infrequent. Here again we often see examples of cases treated palliatively for long periods of time until the very positiveness of the diagnosis proclaims at the same time the hopelessness of treatment. In intestinal carcinomas we have not the age of the patient as so sure an index of the probable nature of the disease as in gastric carcinoma. Carcinomas and especially sarcomas of the large and small intestines are by no means unknown in even young adults. By far more frequent are growths of the large intestine, and fortunately for us they are easiest to diagnosticate. When we see a patient, particularly at the cancer age of life, who presents evidences of intestinal indigestion, with perhaps alternate constipation and diarrhœa and the occasional presence of blood in the stools, we should at once think of malignant change, even in the absence of a palpable tumor or marked cachexia. In this connection we have a laboratory test which is of considerable value. The test for occult blood enables us often to detect the presence of minute quantities of blood in the feces which otherwise it would not be possible for us to observe. Here again I would urge the value of an exploratory operation in the true sense of the word, for we do not have long-continued and marked disturbances of intestinal function without marked pathological causes therefor.

Perhaps even more than is the case with disease of the stomach, physicians, as a rule, are prone to disregard the value of a careful anamnesis and physical examination of the patient in intestinal disorders of the chronic variety. Many patients, indeed, with rectal growths go from one physician to another before one makes a complete examination, digital and instrumental.

Intestinal growths in their early stages present one of the most favorable types for operation, and their location generally permits of complete removal with a large area of healthy adjacent tissue and the corresponding glandular lymphatic area. Even in the comparatively late stages of the disease, unless the lymphatic distribution has become too greatly infected or the growth has spread too far into the mesentery or surrounding viscera, our permanent after-results are often suprisingly good. The later studies upon the relationship of various segments of the intestinal canal with

abdominal lymphatic chains enables us often to remove the whole affected lymphatic area and those glands within it not yet involved. Moreover, the improvement in technique brought about by the use of various methods of mobilization of the large gut by swinging it partially free of its mesenteric and peritoneal attachments while preserving the blood supply has enabled us to overcome many of the mechanical difficulties formerly associated with resection of the bowel.

Carcinoma of the bladder has, as a rule, been regarded as hopeless. The cystoscope has proved of vast value in this field. By its use in the hands of skilled men we are able to diagnosticate malignant growths within the bladder at a stage when formerly they could not be correctly diagnosticated. There can be no excuse for allowing a case of simple hematuria, terminal hematuria, or persistent hematuria to progress without having the source of the abnormal urinary constituents localized by the aid of the cystoscope and the ureteral catheter. An even later stage of procedure within the bladder is the removal of small portions of tumors for diagnostic purposes by the operating cystoscope. This is a method of treatment still in its infancy. Cases have even been reported of the removal of benign myomas by electrothermic instruments within the bladder guided by cystoscopic observation. I cannot but feel that the proper way to approach bladder growths is by the open method through the abdominal incision.

Formerly, practically all bladder operations were performed extraperitoneally, and by this method there is no doubt that we have often failed to secure proper exposure of the field and complete removal of the growth. The newer method of intraperitoneal approach to the bladder probably offers us the solution of the complete extirpation of growths which have deeply invaded the fundus of the viscus. And in view of the success which has attended such procedures we should not hesitate to apply them when they are indicated. There is no doubt that the intraperitoneal bladder operation has passed beyond the experimental stage and is upon a firm footing.

The field of gynecological surgery offers one permanent example of the need of educating the laity to an appreciation of the insidious way in which cancerous growths have their onset. It has been a matter of great difficulty to educate the medical profession in the knowledge that every metrorrhagia in a woman at or near the menopause is a sign which must be most carefully watched. Often, indeed, such cases progress to a complete cessation of the uterine flow without further difficulties than those dependent upon the resultant anemia. Some, however, indicate by their progress that there is some uterine condition other than a mere myopathic or vascular one. Among the laity, indeed, such matters have been treated as trifles until uterine carcinoma at an inoperable stage

makes itself manifest. The importance of at once consulting a physician upon the appearance of a fetid leucorrhœa, or one which presents even the smallest portion of blood, cannot be too strongly insisted upon.

Of late years there has been a systematic effort in Germany to reach the laity and instruct them as regards this matter. The effort is a laudable one. But we must not lose sight of the fact that many of our own profession have not yet come to realize the importance of the early recognition of uterine carcinoma of all varieties and the hopelessness of late operations in this condition.

The operation devised by Wertheim and used in various modifications by American operators has for its object the extirpation of a carcinomatous uterus, together with adjacent tissues, and particularly the pelvic lymphatics about the great vessels into which its infection is liable to spread. No one can deny that every attempt at radical operation in carcinoma is better than a palliative one if it does not involve too high an initial mortality. Yet I am certain that operations at a stage of uterine carcinoma when such an extensive procedure is necessary must be in the vast majority of cases futile. Such has been my experience and that of many others.

Our hope in cancer of the uterus lies in two directions: (1) In the education of physicians to recognize its early manifestations, and the education of the laity as regards prompt professional advice in seemingly minor pelvic conditions; and (2) in the use of the microscopic and pathological diagnosis in every case of curettage for intrauterine disease not directly within the cancer age. I would mention also the recognition of the fact that erosions of the uterine cervix beyond middle age are far more often malignant than has been supposed, and in their earliest stages are favorable cases for radical and completely curative operation. But by far the widest field for the use of the immediate pathological diagnosis in determining the scope of operation and its prognosis we find in malignant tumors of the breast. It is a well-known fact that every tumor of the breast beginning at the so-called cancer age is sufficient to cause the physician the gravest apprehension and should be treated as if it were a malignant growth if a clinical diagnosis alone is to be depended on. This also holds true of all breast tumors of long standing which suddenly show a marked acceleration of growth.

Recent pathological studies have shown us that the borderline between benign and malignant tumors of the breast is by no means a definite one, and that tumors in their incipiency benign may later undergo rapid malignant change. Moreover, we have ample statistical evidence of the frequent occurrence of malignant tumors of the breast in early adult life and even in adolescence.

By careful training of our faculties of observation and long experience, we can, no doubt, attain a degree of certainty in the

macroscopic diagnosis of breast tumors which closely approach that of a rapid microscopic examination. Yet our success with frozen sections has been such as to establish them firmly as an important aid. In breast tumors especially, a frozen section will, on the one hand, often demonstrate to us the uselessness of a radical operation in a growth previously supposed to be malignant, and, on the other hand, will often show an apparently simple chronic mastitis or fibro-adenoma to be a growth which is beginning to show the characteristics of malignant change.

In my own clinic frozen section diagnoses have been almost without exception correct. This has also been the experience at the Massachusetts General Hospital, at the Johns Hopkins Hospital, in the clinics of the Mayo brothers at Rochester, Minn., and in many other institutions.

When we have established the malignancy of a breast tumor by clinical diagnosis or frozen section it is imperative to perform a radical operation. The recent investigations of Handley upon the spread of malignant growths of the breast by the invasion and spread in successive tissue layers and the method of spread by means of the lymphatics make it necessary to remove both the subjacent tissues and the axillary glandular structures.

It has sometimes been questioned whether a radical operation when the axilla is not invaded will not spread rather than avoid infection, but this may safely be answered in the negative.

An interesting fact pointed out by Bloodgood is that, of the recurrences in breast tumors observed by him in a series of cases from Halsted's clinic, many were in cases supposed to be favorable and consisted of carcinomas within the skin scar. He attributes this to the disinclination of the surgeon to perform most radical operations when a less complete one would seem sufficient. I must agree that no matter how favorable the growth, if we are to perform a radical operation, it should be complete in order to give us the best chance of permanent cure, even when a less mutilating procedure might seem sufficient.

It will be seen from the foregoing remarks that the problem of treatment and cure of malignant disease depends entirely upon early diagnosis and surgical treatment. Perhaps the only instance in which of late years it has seemed that our procedures have been too radical has been the case of sarcomas of bones. Bloodgood has lately pointed out that many of these, especially sarcoma of bones in the extremities, which was formerly treated by the most radical procedures, has seemed to recover with simply local palliative operation. It is, indeed, true that perhaps we have been too radical, yet the danger that we may become too conservative in dealing with malignant neoplasms of bones must not be lost sight of.

There is every reason to hope that at some time in the future

there will be discovered not only the specific cause of malignant growths, but also some way of recognizing them earlier than we are at present able to do by clinical methods; and I am convinced that in the course of time experimental research will show us not only the cause of malignant tumors, but will point the way to some other method of cure than by surgical intervention. But until this time arrives, and until we are convinced that our non-operative methods are absolutely certain to cure, we must rely entirely upon early and radical surgery.

As I have stated before, all carcinomas are in the early stages purely local and, unless in some entirely inaccessible place, curable. For the present we must exert all our energy toward refinement of diagnosis and perfection of technique; in this way only will our late results in the treatment of malignant growths show improvement.

THE THENAR AND HYPOTHENAR TYPES OF NEURAL ATROPHY OF THE HAND.

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The types of neural atrophy of the hand, to which I shall direct attention are unaccompanied by sensory disturbances, and for this reason are of especial clinical interest from their rather close resemblance to the early stage of the progressive muscular atrophy, of the Aran-Duchenne type. I believe that many of these cases are either interpreted as such or are regarded as very doubtful. The frequent association of the two affections (neural and medullary) with occupations requiring overuse of the hands and arms enhances the similarity.

It may be said, in general, that the localization of occupation neuritis in the upper extremity is by no means infrequent, and is recognized by all systematic writers on this subject. There are, however, associated sensory symptoms in the distribution of the affected nerve, which constitute an important part of the symptom complex. In literature these cases are usually designated by the name of the occupation which was instrumental in the production of the lesion: a rather crude manner of classifying such affections of the nerve trunks, as a variety of different occupations may produce the same lesion at the same level of the nerve trunk, providing the character of the movement required is the same.

In other words, it is not so much the nature of the occupation as the character of the movements and its frequent repetition, which plays the chief role in the etiology of the professional palsies.

The exposed and superficial situation of some nerve trunks and their relation to bony prominences and tendons are also important factors.

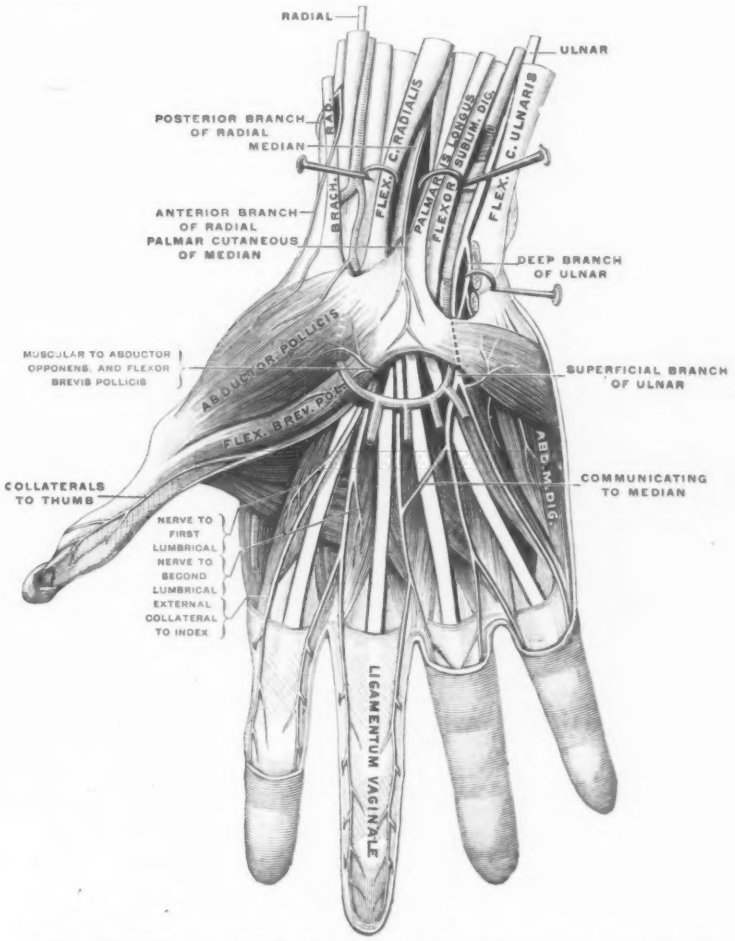

FIG. 1 (Testut's Anatomy).—Showing the superficial and deep palmar branches of the ulnar nerve, and the branches of the median nerve in the hand before removal of the anterior annular ligament.

The general constitutional condition, as well as intoxications of various kinds, also deserve consideration as predisposing factors. It is not uncommonly observed that a certain occupation may have been pursued for many years without ill effects, when a reduction

of the general health, or alcoholic excess, is rapidly followed by the symptoms of neuritis.

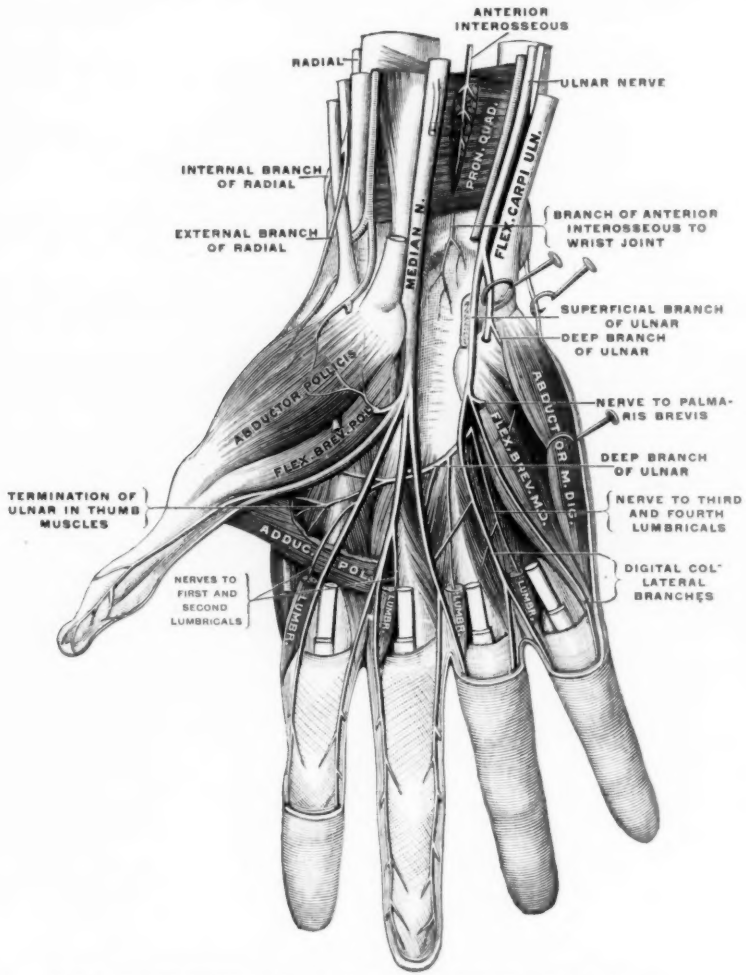

FIG. 2 (Testut's Anatomy).—Showing the branches of the ulnar and median nerves after removal of the annular ligament.

The *motor types* of neural atrophy of the hand are characterized by an absence of objective sensory symptoms, and occur as two distinct clinical types—a *hypothenar type*, dependent upon a com-

pression neuritis of the deep palmar branch of the ulnar nerve, and a *thenar type*, dependent upon a compression neuritis of the thenar branch of the median nerve. Both nerves are purely motor in character, and together supply the entire musculature of the hand, with the exception of a small subcutaneous muscle, the palmaris brevis, which is innervated by a branch from the superficial palmar division of the ulnar nerve.

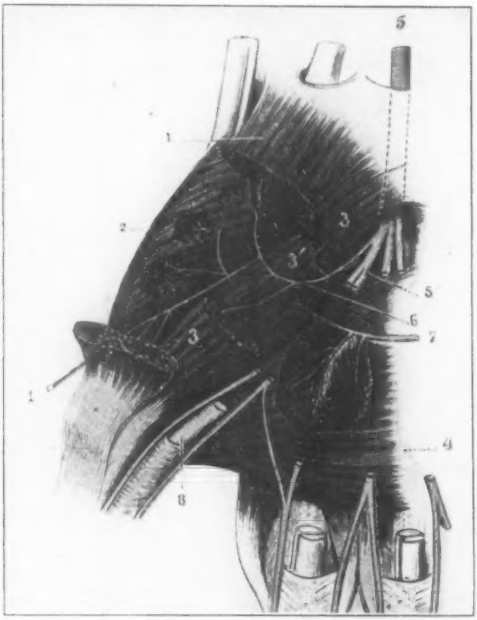

FIG. 3 (Testut's Anatomy).—Showing the motor branches of the thenar eminences: 1, abductor brevis pollicis; 2, the opponens pollicis; 3, 3′, superficial and deep heads of the flexor brevis pollicis; 4, adductor pollicis; 5, median nerve with, 5′, terminal branches; 6, nerve to the thenar muscles (thenar branch); 7, termination of the deep branch of the ulnar in the adductor pollicis and the deep head of flexor brevis pollicis.

The paralysis of the *hypothenar type* is limited to the distribution of the ulnar nerve, and of the thenar type to that of the median nerve, and are accompanied by atrophy and the electrical reactions of degeneration in their respective distributions.

ANATOMICAL CONSIDERATIONS. All the small muscles of the hand are supplied by either the median or the ulnar nerve. The median, through its *thenar* branch, innervates the abductor pollicis, the opponens pollicis, and the outer head of the flexor brevis pollicis. These muscles compose the outer portion of the thenar eminence;

in addition, the first and second lumbricales are usually supplied by the median nerve (Figs. 1 and 3). The thenar branch is purely motor, and leaves the main trunk as it emerges from beneath the anterior annular ligaments of the wrist; it then turns back over the edge of this tendinous membrane, and passes toward the thenar eminence. The compression of the nerve, I believe, takes place as it passes over the annular ligament (Figs. 1 and 2).

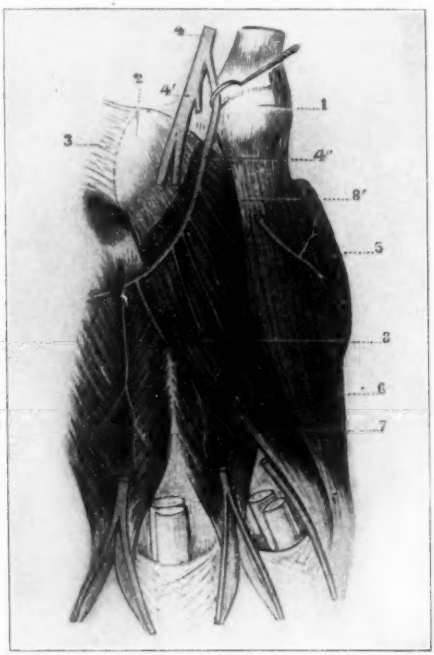

FIG. 4 (Testut's Anatomy).—Showing the deep palmar branch of the ulnar nerve and its relations to the tendinous origin of the abductor minimi digiti and the flexor brevis minimi digiti: 1, pisiform bone; 2, unciform process of the unciform; 3, anterior annular ligament; 4, ulnar nerve; 4′, superficial palmar branch; 4″, deep palmar branch; 5, palmaris brevis; 6, abductor minimi digiti; 7, flexor brevis minimi digiti; 8, 8′, opponens minimi digiti.

All the remaining intrinsic muscles of the hand are supplied by the ulnar. This nerve, just above the level of the pisiform bone, divides into two terminal branches—the *superficial palmar*, which is sensory, and the *deep palmar*, which is purely motor. The deep palmar branch innervates all the muscles of the hypothenar eminence, the palmar and dorsal interossei, and the third and fourth lumbricales. Soon after its origin, the deep palmar passes between the tendinous origins of the abductor minimi digiti and the flexor

brevis minimi digiti, in a downward, backward, and outward direction, winding in its course beneath the hook of the unciform bone, at which point it breaks up into its terminal muscular branches. Occasionally it pierces the tendon of the flexor brevis minimi digiti (Figs. 2 and 4).

In the *hypothenar type* of neural atrophy the nerve is, I believe, compressed at this point; that is, after giving off of its superficial sensory branch and before breaking up into its muscular terminals. As I have already indicated, the palmaris brevis is supplied by a small muscular branch arising from the superficial palmar, so that the function of this muscle would be preserved.

The intrinsic muscles of the hand are therefore supplied by two distinct nerve trunks, both of which are purely motor in character, the one arising from the median and the other from the ulnar nerve. Both of these branches, soon after leaving the trunk of the nerve, are in close relation with tendinous structures, so that when subjected to prolonged or unusual compression, as would occur in certain occupations, they would be exposed to the dangers of injury with consecutive degeneration of the nerve and atrophy of the corresponding muscles.

A Case of Occupation Neuritis of the Deep Palmar Branch of the Ulnar Nerve (Hypothenar Type of Neural Atrophy of the Hand).

J. R., single, aged forty-seven years, has been an oyster opener by occupation for many years, having opened on an average from four to five thousand oysters a day. He has always indulged freely in alcohol, and more especially during the past year. He has had gonorrhœa several times, and a chancroid at the age of seventeen. He denies lues. In opening the oysters he uses the usual oyster knife, having a heavy metal handle and a short blade. The knife handle rests in the hollow of the hand, and is grasped firmly by the fingers, more especially by the little and the ring fingers; the thumb being pressed against the opposite side of the handle, in this way making the grasp firm and guiding the direction of the blade. So that in using this knife, the act consists chiefly in flexion of the fingers, more especially of the little and ring fingers, with an opposing movement of the thumb; the handle is not pressed against the hypothenar region with any degree of power.

Onset. Three months before coming under my observation he noticed while working that he experienced considerable difficulty and awkwardness in handling the knife. The following day his hand was no better, and he was forced to abandon his occupation. Since that time he has been unable to resume work. He experienced no pain in the hand whatever, and at no time were there any paresthetic disturbances in the fingers.

PRESENT CONDITION. The patient is a short, somewhat corpulent, and very muscular man. The general physical and neurological examination is negative. On extending, or attempting to extend, the fingers of the right hand, there develops a slight tremor, which is not present on the left. The fingers cannot be completely extended, but are held in a somewhat flexed position, which is more apparent in the little and the ring fingers. Both the little and the index fingers are held somewhat abducted, while the middle and ring fingers remain in close apposition. There are evident signs of muscular atrophy in the intrinsic muscles of the hand, and the hypothenar eminence feels soft and flabby. No fibrillary twitchings are visible. He is unable to separate or approximate the fingers. Adduction of the thumb is possible, but with much less force than on the left side. He is also unable completely to extend the middle and distal phalanges, or to flex the basal phalanges while holding the fingers extended. No voluntary movements are possible in any of the muscles of the hypothenar eminence, *with the exception of the palmaris brevis muscle*, which produces the typical creasing of the skin over the hypothenar region. The movements of the thumb are, on the contrary, quite free and active, and there is very good power of abduction and apposition. Flexion of the basal phalanx of the thumb and adduction are distinctly paretic.

There is normal power in the extensors and flexors of the wrist, and in the long flexors and extensors of the fingers. I would especially emphasize the preservation of the ulnar flexion of the wrist and the long flexors of the fingers supplied by the ulnar nerve. The muscles of the upper arm and shoulder are normal.

The tendon reflexes of both upper and lower extremities are normal. There is no tenderness of the nerve trunks or of the muscular tissues of the right arm and hand. The skin of the right arm, hand, and fingers shows absolutely no impairment of sensation to touch, pain, or temperature. The deep sensibility of the fingers is preserved, and the stereognostic sense is unimpaired.

Electrical Reactions. The muscles of the upper arm and forearm react normally to both currents. Strong faradic and galvanic currents passed through the ulnar nerve in the groove at the elbow produce flexion movements of the wrist and fingers on the ulnar side, but no response in the intrinsic muscles of the hand. Currents passed through the median nerve at the bend of the elbow and in the forearm produce distinct contraction in the muscles of the thenar eminence. Strong faradic currents applied directly to the muscle fail to elicit any response in the muscles of the hypothenar eminence or the interossei. A good response, however, is obtained in the muscles of the thenar eminence. The direct galvanic current produces in the muscles of the hypothenar and interossei a slow vermicular response with definite polar changes. In the thenar

eminence a normal galvanic response is elicited over the area of the abductor and opponens pollicis. If stronger currents are used, and if the electrode is placed over the eminence toward the ulnar side of the hand, a mixed normal and degenerative reaction ensues, evidently from diffusion of the currents to the deeper muscles of the thenar region which are degenerated.

REMARKS. The case just described presents a paralysis of all the intrinsic muscles of the hand supplied by the ulnar nerve, with evidences of atrophy. The reactions of degeneration are complete. Sensation over the ulnar distribution is normal, and at no time was pain or paresthesias experienced in this area. Furthermore, the small muscle group of the thenar eminence supplied by the median nerve was normal in its function and electrical responses. The man had been an oyster opener since his boyhood, and had never previously experienced any difficulty of this nature. He was, in addition, addicted to alcohol, which had been excessive during the last year, so that aside from occupation as a factor, a toxic element must also be considered (toxico-professional palsy). In using the oyster knife the heavy handle did not impinge on the base of the hypothenar region, so that direct pressure upon the nerve trunk may be excluded. It was held chiefly in the grasp of the fingers, more especially of the little and ring fingers, assisted by the opposing movements of the thumb. Flexion of the basal phalanx of the little finger brings into action both the abductor and flexor brevis minimi digiti, which would cause a compression of the nerve as it passes between the tendinous origin of these two muscles. I would particularly emphasize the preservation of the palmaris brevis muscle, which receives its innervation through the superficial palmar, which is additional clinical proof in favor of placing the site of the compression in the deep volar branch.

In my original paper on this subject,[1] three cases were recorded associated with the following occupations: That of jeweller, brass polisher, and machinist. A summary of the clinical pictures is briefly as follows (Fig. 5): The palsy developed without the accompaniment of pains, paresthesias, or anesthesias in the ulnar nerve distribution. On holding out the affected hand the fingers could not be completely extended, a slight flexion persisting in all, but more especially in the little and ring fingers. The index and little fingers are held somewhat abducted, while the middle and ring fingers remain in close apposition; there is a loss of spreading and approximation movements of the fingers, of flexion of the basal phalanges, and of extension of the middle and distal phalanges. Adduction of the thumb is also lost or very much diminished.

[1] Occupation Neuritis of the Deep Palmar Branch of the Ulnar Nerve, Jour. of Nerv. and Ment. Dis., 1909.

Flexion of the basal phalanx of the thumb is weakened; abduction and apposition of the little finger are abolished. In brief, an ulnar paralysis, limited to its distribution in the hand. With the paralysis there is more or less atrophy of the muscles, and electrical reactions of degeneration are present. In all of the cases there was a considerable impairment of the more delicate functions of the hand, and the occupation instrumental in producing the palsy had to be abandoned.

FIG. 5.—Occupation neuritis of the deep palmar branch of the ulnar nerve, occurring in a jeweller, with atrophic paralysis of the intrinsic muscles of the left hand supplied by the ulnar nerve. Complete reactions of degeneration. No objective sensory disturbances.

With the preservation of the long flexors and extensors of the wrist and fingers, and the muscles of the thenar eminence supplied by the median nerve, there still remained a considerable degree of power and variety of movement in the hand. This paralysis without sensory disturbances I attributed to a compression neuritis of the deep volar branch of the ulnar, as it passes between the tendinous origin of the muscles of the hypothenar region (Figs. 2 and 4).

In all of the cases in which this form of paralysis occurred the occupation was one requiring flexion movement of the fingers, more especially of the basal phalanges. When the basal phalanx of the little finger is flexed, both the abductor and the short flexor

are put in action, and as the short abductor takes its origin from the pisiform bone, and the short flexor from the hook of the unciform, the deep volar branch separating them at their points of origin, persistent and long-continued flexion of these muscles would seriously expose this nerve to the dangers of muscular compression. The possibility of traction must also be considered from the relation it bears to the hook of the unciform.

Cases of Compression Neuritis of the Thenar Branch of the Median Nerve (Thenar Type of Neural Atrophy of the Hand).

CASE I.[2] (Neurological Clinic of the Cornell Medical School).—E. G., aged fifty years; engaged in the occupation of folding and sealing newspapers, for mailing purposes, during the last thirty years. He works in all about seven hours a day. During this time he folds and sorts heavy sheets of paper, which bring into play chiefly the thumb and fingers. After the packages are sealed they are carried and deposited in a convenient place, which throws a considerable strain on the arms and shoulders. Occasionally during the last nine years, after an unusual stress of work, he has experienced a general numb, tired feeling in the arms and shoulders, and at times the fingers felt numb and would tingle, but this would soon pass off with rest and never lasted more than an hour or so. At times he also has a cramp-like sensation in the right hand, especially the thumb. This also was very transient in nature. In folding the heavy sheets of paper the strain is largely caused by the pressure of the thumb against the roll, more particularly of the right hand. About two years ago, he first noticed a slight wasting of the muscle along the radial side of the thenar eminence. This area was small at first, but gradually increased in size, up to a certain point, and has remained stationary ever since. During this time he continued his occupation, saving the right hand as much as possible, which threw an unusual amount of strain on the left. Of late, he finds that the left hand is also becoming affected in a similar manner.

PRESENT CONDITION. The general neurological examination is negative. The heart, lungs, and kidneys present no symptom of disease. Both upper extremities are well developed and present no diminution in the gross motor power, with the exception of the movements of the thumb on the right side, and to a less extent on the left. There are no fibrillary twitchings, and the biceps, triceps, and supinator reflexes are present.

There is in the right thenar region a sharply defined atrophy, which extends along the outer side of the eminence. This presents

[2] Presented at a meeting of the New York Neurological Society, November, 1909.

a rather deep depression, as if the muscular tissue had been scooped out (Fig. 6).

Over the left thenar eminence a slight flattening is perceptible along the metacarpal bone, and the muscular tissue is soft and doughy. There is, however, no well-marked atrophy. The other intrinsic muscles of the hand, the hypothenar and the interossei, present no signs of atrophy and no diminution in their motor power. The sensation of both upper extremities is unimpaired, and very careful tests of the tactile, pain, and thermic sensibility of the hands show no objective impairment in either the ulnar or median distribution. The dynamometer on the right hand registers 38, and on the left, 41.

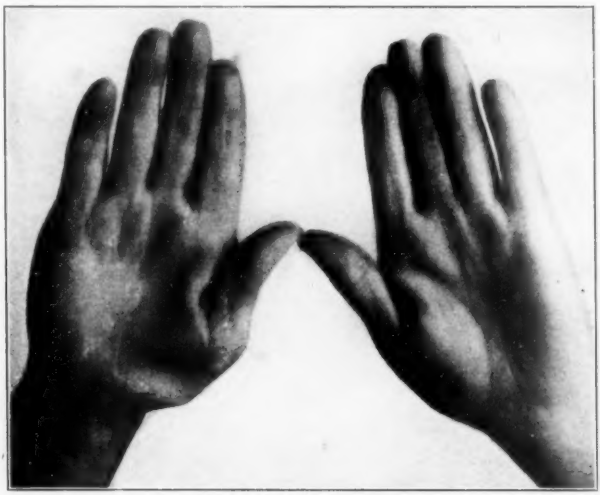

FIG. 6.—Occupation neuritis of the thenar branch of the median nerve, showing a circumscribed atrophy of the right thenar eminence which contains a remnant of muscular tissue showing the reactions of degeneration; the sensations are normal. A scarcely perceptible flattening of the left thenar, with complete reactions of degeneration in the abductor and opponens pollicis is present.

Electrical Reactions. Electrical examination of the upper extremities shows normal reaction in all the muscles, with the exception of those composing the thenar eminence in the distribution of the median nerve. An indirect faradic or galvanic current passed through the median nerve at the bend of the elbow, fails to produce any response in the corresponding muscles of the thenar region on either the right or the left side. Faradic currents directly applied to the right thenar fail to produce a reaction in either the abductor or opponens pollicis. Strong galvanic currents applied directly to the right thenar region over the atrophic area produce a slight vermicular response in a small muscle remnant. Direct

faradic excitation of the left thenar eminence fails to elicit any response in the abductor pollicis or opponens pollicis. The galvanic current produces a typical slow vermicular reaction in these muscles, with reversal of the poles.

The patient was advised to give up his occupation, and electrical treatment has been systematically carried out. On November 22, 1908, the atrophy of the right thenar eminence was the same as on the first examination. There was also present a slight but definite flattening over the left thenar region, as was previously noted. The electrical changes were practically the same as on the first examination; that is, no response in the right thenar over the atrophic

FIG. 7.—Photograph of same case as Fig. 6, taken one year later. The atrophy of the right thenar is less marked, and there is still slight flattening apparent over the left thenar, with reactions of degeneration. No sensory disturbances.

area excepting to strong galvanic currents, which elicited a vermicular response in a persisting muscle remnant, of which the anodal closing contraction was greater than the cathodal closing contraction. In the left thenar region the abductor pollicis and opponens pollicis showed complete reactions of degeneration. There was an absence of pains, paresthesias, or objective sensory disturbances in the hands or fingers; no fibrillary twitchings and no evidence of atrophy in the small muscles of the hand supplied by the ulnar nerve.

June 1, 1909. Patient complains occasionally of dull aching pain in the right metacarpal joint, both at its articulation at the wrist and with the thumb. These seem to change with the weather. He has no paresthesias and no objective sensory disturbances in the median or ulnar distribution. At times he has an aching pain

in the left thenar region, which is dull in character. The flattening along the left thenar eminence is less marked, and the atrophic excavation of the right thenar is less sharply defined (Fig. 7). Electrically there is no faradic response in the abductor or opponens pollicis on either side. The left thenar still shows sluggish galvanic responses with reversal of the poles, and in the right no reaction at all is elicitable, save for the small muscle remnant previously noted.

CASE II. (Referred by Dr. Isadore Abrahamson, of New York).—Patient is a woman, aged sixty-nine years, married, and has two children; a housewife by occupation. When about fifty years of age she did considerable ironing, working many hours each day. In using the irons she held the thumb well under the handle, so that there was no direct pressure upon the thenar eminence. She, however, grasped the handle firmly, which would bring into play the small muscles of the thumb. A little later she first noticed a slight wasting of the right thenar region along its radial side, which gradually increased in size. A year later a similar condition developed in the thenar region of the left hand, likewise along its radial border. These areas of atrophy have persisted up to the present time and have remained stationary. She never gave up ironing, but did less as she grew older. At the time of the onset she had a numb feeling in the extreme tips of all the fingers of both hands. This, however, was not permanent, and would come and go. It was not confined to the median distribution, and was more in the nature of an acroparesthesia.

PRESENT CONDITION. April 28, 1909. The patient has a typical *thenar atrophy* on both sides, more marked upon the right than on the left. There are no fibrillary twitchings, and no atrophy or weakness in the other muscle groups of the hands or arms. The arm-jerks are present, and the *objective sensation is perfectly normal*. There is not the slightest trace of any disturbance of the touch, pain, or temperature sensibility in either the ulnar or the median distribution of the hand.

Electrical Examination. There is no faradic response, either direct or indirect, in the abductor pollicis or opponens pollicis on the right or left side, nor can these muscles be contracted through the median nerve by strong galvanic currents. The direct galvanic current applied to the right thenar eminence, where the atrophy is more marked, elicits no response whatever. In the left hand, however, a slow vermicular reaction is produced in the atrophic area, the anodal closure contraction being greater than the cathodal closure contraction.

CASE III. (Verbal communication by Dr. H. M. Moyer).—Following the discussion of my paper,[3] which was read at a meeting

[3] Occupation Neuritis of the Thenar Branch of the Median Nerve: A well-defined Type of Clinical Atrophy of the Hand. Trans. Amer. Neurological Association, 1909.

of the American Neurological Association in May, 1909, one of the members communicated to me, a personal experience with thenar atrophy. This had come on after a long bicycle ride, during which he had used hard grips on the handle bars. A few days later he noticed fibrillation and waving of the muscular tissue along the radial side of the right thenar eminence. This was followed in the course of a week or two by distinct wasting of the muscles, which corresponded exactly to the distribution of the thenar branch of the median nerve, as shown in Fig. 6. With the appearance of atrophy, the fibrillary waves ceased and did not recur subsequently.

At no time were pain, subjective or objective disturbances of sensation in the hand noted. Some of his colleagues suggested the pleasing possibility of progressive muscular atrophy, but in the course of a few months the scooped out, atrophic depression of the thenar region began to fill in, and at present no difference in the volume of the two sides is apparent.

REMARKS. The thenar type of neural atrophy of the hand is readily recognized by the characteristic limitation of the atrophy to the abductor pollicis, the opponens pollicis, and the outer head of the flexor brevis pollicis, all of which are supplied by the thenar branch of the median nerve. As the atrophic area is situated between the first metacarpal bone externally and the body of the inner portion of the flexor brevis pollicis, a sharply demarcated depression results, as if the muscular tissue had been scooped out.

The electrical reactions vary with the stage and the degree of the atrophic process, and are characteristically neural. Objective disturbances of sensation in the distribution of the median nerve were absent in all of the cases, so that the thenar filaments must have been injured after leaving the main trunk of the median (Figs. 1 and 2).

It will be recalled, from the anatomical descriptions, that immediately after leaving the main trunk the thenar branch stands in immediate relationship to the palmar border of the anterior annular ligament, beneath which it emerges and over which it passes in a backward and outward direction to its destination in the muscles of the thenar region. The injury to the nerve, therefore, must take place at this point, induced by the continuous or frequently recurring pressure of muscular action.

The general usefulness of the hand is not greatly impaired in this type of neural atrophy, except for finer movements, in which the thumb plays an important role, as, for instance, in writing.

The first metacarpophalangeal joint may also be considerably weakened and relaxed as a result of the atrophy.

Because of the comparatively slight disturbance of the general power and utility of the hand, the occupation which was instrumental in the production of the paralysis is sometimes persisted in, and under these circumstances the atrophy may become perma-

nent, as in Case II and probably in Case I, although here a slight improvement was apparent after electrical treatment for one year. In Case III the complete restoration of muscular tissue and function is to be attributed to the prompt recognition of the etiological factor and its removal.

The prognosis in these cases may therefore be regarded as favorable, if the causative factor is discovered at an early stage and proper precautionary measures and treatment are instituted. In the literature of professional palsies and atrophy of the hand, cases are cited in which there was an atrophy of the thenar eminence, usually, however, in conjunction with other of the small muscles of the hand, or with sensory disturbances in the median distribution.

I am aware of no reported cases in which the atrophy has been shown to be limited to the thenar distribution of the median nerve, as in the group of cases just described, the clinical importance of which is dependent upon their resemblance to the hand atrophy of spinal origin.

DIAGNOSIS. The *neural types* of atrophy of the hand muscles are readily separated from those of myelopathic and myopathic origin by the strict limitation of the paralysis to the distributions of the ulnar and the median nerves and by the degenerative character of the electrical reactions.

The absence of sensory disturbances serves to separate them from the atrophy which follows lesions and compressions of the ulnar and median nerves higher up, that is, above the origin of the deep palmar and thenar (motor) branches.

In the *thenar* and *hypothenar types* of neural atrophy the distribution of the palsy and accompanying atrophy are the same as after other lesions of the median and ulnar nerves, the degree of the atrophy depending upon the severity and duration of the palsy.

In none of the cases were fibrillary twitchings present in the affected muscles, with the exception of one case only, in which fibrillary waves were noted at the time of onset, but ceased with the appearance of atrophy, and did not recur subsequently. In reaching a diagnosis, I would emphasize the importance of demonstrating the limitation of the paralysis, atrophy, and degenerative reactions to the motor distribution of the ulnar or median nerves, as the case may be. This neural limitation of the palsy may be overlooked unless special care is exercised, as there are no sensory symptoms to suggest the nerve distribution. In the hypothenar type there is some atrophy of the muscles which go to form the thenar eminence, that is, the adductor pollicis and the inner head of the flexor brevis pollicis, which are supplied by the ulnar nerve. This produces some flattening and atrophy in the thenar region, and might simulate involvement of the median nerve on superficial examination. Still greater care must be exercised in interpreting the electrical reactions in the thenar type of atrophy. The

diffusion of currents to a part of the flexor brevis pollicis and the adductor pollicis, both of which are supplied by the ulnar nerve, may give the impression of a positive reaction of degeneration in the thenar region, and yet the muscles supplied by the thenar branch of the median nerve may be perfectly normal.

I would also recall a type of occupation atrophy of the hand described by Gessler,[4] which bears some resemblance to the hypothenar type of neural atrophy. This question I have already discussed at some length in a previous communication.[5] Gessler[6] regarded the underlying lesion in his cases as a degeneration of the motor end-plates and intermuscular nerve terminals, induced by prolonged and persistent muscular contractions with insufficient muscular relaxation, this producing an anemia of the parts, with consecutive degenerations of these delicate neural structures. As a basis for this theory he presented the results of some experimental studies in warm- and cold-blooded animals in which such lesions were produced. In my opinion, Gessler's views require further clinical confirmation before they are accepted as the pathological basis for a group of professional muscular atrophies. The class of cases which I describe are, however, readily separated by the strict limitation of the atrophic palsy to the distribution of either the median or ulnar nerves.

A Case of Progressive Muscular Atrophy, Resembling the Thenar Type of Neural Atrophy (Fig. 8).

The following case is recorded as showing the rather close resemblance which may exist between the spinal and the neural atrophy of the hand.

The patient, a woman, unmarried, aged forty-two years, was admitted to the Cornell Clinic, March 22, 1910. Since her eighteenth year she has been a victim of epilepsy. She is a waitress and helper in a hotel; there is nothing exceptional in her occupation, which is more or less general in character, except that three times each day she slices bread for the entire establishment, which requires constant cutting for about twenty minutes. For this purpose a large bread knife is employed, which is grasped firmly by the right hand. There is no history of venereal disease or of alcoholic excesses. One year ago she passed through an attack of subacute articular rheumatism, lasting about seven weeks.

Her present trouble dates from June, 1909, when she first noticed a slight weakness of the right hand, and about the same time a

[4] Die motorische Endplatte und ihre Bedeutung für die peripherische Lähmung, Habilitations Schrift, München, 1885.

[5] Jour. Nervous and Mental Disease, 1909.

[6] Eine Eigenartige Form von progressiver Muskelatrophy. Med. Correspondenzbl, 1896, 281.

flattening and wasting of the ball of the right thumb, both of which have gradually grown worse. There has been no pain in the hand at any time and no paresthesia.

Examination. There is a well-marked atrophy of the right thenar eminence along its radial side (Fig. 8). There is also a slight, scarcely perceptible thinning of the muscles of the third and fourth interosseous spaces and of the hypothenar region. Fibrillary twitchings were not demonstrable at first, but subsequent examina-

FIG. 8.—A case of early muscular atrophy of spinal origin, resembling the thenar type of neural atrophy. In addition to the wasting on the radial side of the thenar, there were atrophy and fibrillations of the interossei and slight atrophy along the ulnar side of the forearm.

tions revealed their presence in the interossei and in some of the muscles of the hypothenar. The ulnar side of the forearm is also the seat of slight wasting, there being a difference of one-half inch between the two sides. All movements of the right hand are readily performed, but are distinctly weaker than the left. The gross motor power of the other muscles of the upper extremity is undiminished.

The reflexes of the upper extremity are active on both sides, but more so on the right, where the periosteal and bone reflexes of the hand and fingers are readily elicited. Sensation is perfectly normal. The tendon reflexes of the lower extremities are present

and active, but not exaggerated. There is no Babinski phenomenon on either side.

The pupils are equal and react normally. A careful general and neurological examination failed to reveal any symptoms, other than the weakness with atrophy of the right hand, with fibrillary twitchings and exaggeration of the reflexes of the right upper extremity.

Electrical Reactions. Strong faradic and galvanic currents passed through the median nerve fail to elicit any response in the atrophic muscles of the right thenar eminence. A strong faradic current applied directly to the thenar eminence produces a sluggish response, which apparently originated in the opponens pollicis. The direct galvanic current elicits a slow vermicular response in the thenar region, in which the A C C is $>$ K C C. The electrical response, both direct and indirect, of the other intrinsic muscles of the hand, as well as those of the forearm, are practically normal.

COMMENT. This case is interesting from a diagnostic point of view.

The atrophy is well defined in the thenar region, and at the first glance appears limited to the distribution of the thenar branch of the median nerve (Fig. 8). The completeness of the reactions of degeneration, which are confined to the muscles of the thenar region, are also very suggestive of a neural origin.

A more careful scrutiny of the case, however, shows a slight general wasting of the hypothenar, interossei, and along the ulnar side of the forearm, with fibrillations, exaggerated arm reflexes, both tendon and periosteal; so that the muscular atrophy must be interpreted as of spinal origin, an early stage of the Aran-Duchenne type.

It is, of course, not impossible that the two conditions, neural and spinal, may be present in combination, as certain occupations requiring excessive use of the hands are recognized etiological factors in both groups of cases. It is certainly singular that atrophy and reactions of degeneration should be so circumscribed to the distribution of the thenar branch in a case of progressive muscular atrophy.

CONCLUDING REMARKS. In addition to the atrophic paralyses of the intrinsic muscles of the hand, of *myelopathic* and of *myopathic* origin, I believe that a *neural* type should also be recognized. Those of neural origin may be separated into two well-defined clinical types, both due to a compression lesion of a *motor* branch of a mixed nerve. These may be appropriately designated as follows:

A *hypothenar type*, which term indicates the site of the compression at the base of the hypothenar eminence and its relationship to the ulnar nerve.

A *thenar type*, which also indicates the site of the compression at the base of the thenar eminence, and the relationship to the median nerve.

THE ASSOCIATION OF SUPPURATIVE DISEASE OF THE NASAL ACCESSORY SINUSES AND ACUTE OTITIS MEDIA IN ADULTS.

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THE subject indicated in the title of this paper is one to which I have given considerable attention for several years. The clinical study has been almost entirely on patients seen in private practice, thus affording an opportunity for a more thorough examination than can usually be given to the individual patient in a clinic.

While many of the cases of suppurative nasal accessory sinus disease are easily diagnosticated, others are only recognized after cleansing the nares, thoroughly contracting the nasal mucous membrane by cocaine and adrenalin, and observing after a lapse of a quarter of an hour or more, the escape of secretion into the nares or nasopharynx. Transillumination, in the case of the antra, and to a less extent for the frontals, is an important aid to diagnosis.

I have chosen to limit the report to adult cases, because, while suppuration in the nasal accessory sinuses undoubtedly occurs in children from the time of the earliest appearance of the sinuses up to the time of their full development, it is often very difficult to be positive of the diagnosis of sinus disease.

The factors which in children prevent our satisfactory examination are: (1) The small size of the nasal chambers; (2) the proportionately larger size of the turbinal bodies; (3) the relatively greater amount of swelling of the turbinal bodies when acutely inflamed; (4) the intractability of children to the necessary application of cocaine, and the use of instruments for probing and puncturing the cavities; and (5) transillumination in most children under twelve years of age is unreliable or positively misleading. The two antra develop so unevenly that one may be much darker than the other, and yet, if the darker one is washed out, no secretion is found in it.

It seems best to divide the subject into two parts: (I) Statistics, and (II) Personal impressions.

I. STATISTICS. I have analyzed the histories of all *new* patients seen between October 1, 1909, and March 1, 1910, who came to me suffering from acute suppurative otitis media, acute rhinitis, acute sinusitis (using this term to indicate suppuration of one or more of the nasal accessory sinuses), and chronic sinusitis.

There were 16 cases of acute suppurative otitis media; 26 cases of acute rhinitis, without sinus involvement; 31 cases of acute sinusitis (all of which also had an acute rhinitis); and 36 cases of chronic sinusitis.

I shall study these cases from an otological and a rhinological standpoint.

Otological Standpoint. The 16 cases of acute suppurative otitis media sought relief of the earache, and regarded the accompanying "cold in the head" as of little moment. The examination of the fundus revealed a red and bulging membrana tympani. A spontaneous perforation had occurred in 3 cases. In all 16 the operation of myringotomy was performed, usually after inducing nitrous oxide anesthesia. In 3 of the 16 cases, 19 per cent., a thorough examination of the nares and sinuses showed only an acute rhinitis, with no involvement of any of the sinuses. All 3 made an uneventful recovery.

Of the 13 remaining cases, all had an acute rhinitis complicated by acute sinus disease; that is, 81 per cent. of this series of acute otitis media had at the time of their first visit, and antedating the onset of the aural disease, a suppuration in the nasal accessory sinuses. Of these cases, 8 made an uneventful recovery for ears and sinus disease, while in 5, or 39 per cent., the disease extended to and involved the mastoid to such an extent that a mastoid operation was performed.

In 1 case, a nurse, Miss C., had acute rhinitis, complicated by right antrum disease, four days before pain in the ear began. The pain in the ear commenced at 6 P.M. At 8.30 P.M., under nitrous oxide anesthesia, myringotomy was done. A smear at the time of operation revealed the pneumococcus. On the second day, there was a profuse bloody discharge and mastoid tenderness; on the third day the mastoid tenderness had increased with considerable prolapse of the posterior-superior wall; on the fourth day the tenderness of the mastoid increased with œdema of the skin over the mastoid, and the prolapse was more marked. As there were no facilities for operating on the mastoid or caring for the patient in the Nurses' Home, she was sent to the New York Eye and Ear Infirmary, where Dr. E. B. Dench exenterated the mastoid. The patient made an excellent recovery.

One of the cases, a nurse, Miss B., had influenza, diphtheria, and an acute pansinusitis. Both mastoids were involved, and operated on by my associate, Dr. H. M. Taylor.

Another mastoid case, Mrs. R., had suppuration in the left frontal, ethmoid, and antrum, and probably also the left sphenoid; but a septum, enormously deflected to the left, prevented examination of the left sphenoid. The left mastoid and sinuses healed.

Miss S. had the right frontal, ethmoid, antrum, and sphenoid involved. The right mastoid was operated on and recovery ensued.

Another patient, Mr. M., had the right antrum alone involved. The right mastoid was operated on and recovery followed.

A very interesting clinical fact in this series of mastoid cases is that the infection of the tympanum and mastoid was limited to the

same side as that of the nasal accessory sinus disease. In the bilateral mastoid case there was a bilateral nasal involvement.

Of the 8 uncomplicated cases of otitis media, *all* had pus in the antrum of the corresponding side. Three also had pus in the frontals of the same side, and 2 had pansinusitis. Three other patients sought relief from a severe earache. The pain was referred to the auditory canal and mastoid region. In 2 of the cases the pain was unilateral, in 1 bilateral. In all of these cases the fundus and canal were normal. The slightest touch of the skin over the mastoid proved exquisitely tender. They were typical cases of otalgia. In one case the antrum on the painful side was filled with pus. A few irrigations of the antrum cured it and the otalgia. In the bilateral otalgia case there was a chronic pansinusitis. On establishing good drainage from the sinuses, the otalgia disappeared. The third case had a chronic suppuration in the sphenoid and posterior ethmoid of the otalgic side. She still has exacerbations and remissions of her sinus disease, and *pari passu*, of the otalgia.

Rhinological Standpoint. There were 26 cases of acute rhinitis. In order that there may be no misunderstanding about these cases, I wish to state that it is unusual for me to see the milder forms of this disease. Most of the cases are accompanied by hypervascularization of the tissues and considerable hypersecretion, the character varying from watery to mucopurulent, according to the stage of the disease. It is often difficult to be certain that there is not some slight involvement of the sinuses. If either antrum on transillumination was darker than the other, it was irrigated.

Of these 26 cases, 23 did not have acute ear symptoms or signs other than a feeling of stuffiness from tubal congestion, and a slight dilatation of the vessels of the tympanic membrane. Three of the 26, or 11.5 per cent., had acute suppurative otitis media. I have been unable to find in rhinological or otological literature any figures for comparison by which to judge whether this percentage of aural complication is high or low.

Acute Sinusitis. There were 31 cases of acute sinusitis. Thirteen of these cases (42 per cent.) had an acute suppurative otitis media as a complication at the time they came under observation. The ears were treated as heretofore described. The treatment of the sinus disease consisted in contracting the nares with a 2 per cent. solution of cocaine, waiting for ten minutes or longer, until by inspection the swelling of the nasal mucous membrane had subsided, and gentle irrigation of each naris, by means of a syringe containing a warm (temperature, 110° F.) normal saline solution, to which 0.3 per cent. of bicarbonate of sodium was added; and further cocainization beneath the inferior turbinate, and irrigation of one or both antra through a Myles cannula passed through the nasal wall beneath the inferior turbinate into the antrum. If the frontal sinus did not

drain satisfactorily, the anterior end of the middle turbinate was amputated. The sphenoid was irrigated by means of a cannula inserted into the cavity through the ostium.

Of the 18 sinus cases not complicated by otitis media when first seen, there was but 1 case which subsequently developed an otitis media demanding operation.

H. S. S., Jr., had a slight intermittent earache for forty-eight hours, for which I was consulted. The right fundus was red with only a slight bulging of Schrapnell's membrane, and hearing was slightly impaired. The left fundus was normal. He had a pansinusitis. I did not perform myringotomy, regarding it as a catarrhal condition which might resolve without operative interference. The nares were irrigated twice daily and the maxillary sinus daily or every second day for a couple of weeks. At the end of that time the fundus had nearly returned to normal, the hearing was normal, and the acute rhinitis and sinuses practically well. He was exposed to some fresh infection (possibly a mild scarlatina), his sinuses discharged worse than ever, and there was pronounced redness and bulging of the right membrana tympani requiring a myringotomy, which was performed by Dr. McKernon.

In none of the other 17 cases, although their nares were repeatedly carefully syringed, did any aural complication develop.

I believe that the aural complication in that one case was the result of the new infection rather than any fault in the technique of irrigation.

In the 13 cases associated with otitis media the treatment of the nasal sinuses was conducted as described for the uncomplicated cases.

Chronic Sinusitis. There were 36 cases of chronic sinusitis. The duration of the disease varied from two years to twenty or more. In 4 cases the disease was limited to one antrum; in 1 case to the sphenoid and posterior ethmoid of one side; in 16 cases there was a unilateral involvement of all the sinuses, and in 15 cases, a bilateral involvement of all the sinuses. Although all of these cases were under treatment by syringing, various intranasal operations, etc., for some weeks, but 1 case developed acute otitis media.

That patient, Miss N., had pansinusitis; she gave a history of having had otitis media before coming to me. Both antra had been widely opened intranasally. A date was set for an external operation on the frontals. On the morning of that day she came to the office with a spontaneous rupture of the right membrana tympani and a purulent discharge. The sinus operation was postponed until the otitis disappeared.

In this series, 1 case in 36 (about 3 per cent.) developed acute otitis media.

To recapitulate: 81 per cent. of acute otitis media cases had sinus disease; 11.5 per cent. of acute rhinitis cases had acute suppurative

otitis media; 42 per cent. of acute sinusitis cases had acute suppurative otitis media; and 3 per cent. of chronic sinusitis cases had acute suppurative otitis media.

II. Personal Impressions. The clinician gradually accumulates an experience which is invaluable in forming his judgment as to diagnosis and treatment. While the foregoing statistics cover too short a period and too few a number of cases to be accepted as final, I wish to add some observations which I feel sure will be concurred in by other clinicians since attention is called to them:

1. Otologists agree that the infection in a large percentage of cases of acute otitis media proceeds through the Eustachian tube, complicating acute rhinitis and acute nasopharyngitis. I believe that the severer types of acute rhinitis accompanied by acute infection of the nasal accessory sinuses are far more apt to be complicated by aural disease than the milder types of acute rhinitis.

2. It is extremely rare for a patient with acute sinus disease, coming to us in the early stages, before acute otitis media has developed, to develop subsequently, during the course of the treatment, acute otitis media.

3. I am convinced that the early recognition of acute sinus disease, and appropriate treatment for its relief, will prevent many a patient from developing acute otitis media.

4. The fact that acute otitis media usually occurs on the same side as the sinus disease inclines me to the belief that the pus from the various sinuses bathes the pharyngeal orifice of the Eustachian tube and is thence forced into and infects the tympanum.

5. Cases of acute otitis media, associated with nasal accessory sinus disease, are more likely to develop such a degree of mastoiditis as to require a mastoid operation than otitis cases not complicated by nasal accessory sinusitis. One explanation of this may be in the more severe character of the infection. I am inclined to believe, however, that some patients would repair the damage to the tympanum and mastoid if relieved of the added burden of the nasal disease. I have repeatedly seen cases of severe otitis media and mastoiditis, with all the indications for mastoid operation, recover without a mastoid operation when the nasal sinusitis was recognized and treated.

6. Patients suffering from chronic suppuration in the nasal sinuses are much less prone to acute otitis media than those having acute sinusitis. In the light of modern bacteriology this may be accounted for in two ways: (*a*) The bacteria found in the pus in many cases of chronic sinusitis grow very poorly on any nutrient media; they seem to have lost much of their virulency. Should they be forced into the tympanum through the Eustachian tube, they may not infect the ear. (*b*) It is also probable that the antibodies formed in the chronic cases are a prevention against inciting a new infection. It is a well-known fact that after any operation, intranasal or external,

on a case of chronic sinusitis, the virulency of the bacteria is greatly increased, owing to the wound secretions forming an excellent nutrient medium; hence the cellulitis or erysipelas which develops after some of our external operations in cases of chronic nasal accessory sinus disease. I am not surprised that a small percentage of patients having chronic sinusitis, on whom intranasal operations are performed, develop acute otitis media or even mastoiditis. The wonder is that more do not.

THE METABOLIC CHANGES IN HEMATOPORPHYRINURIA NOT OF DRUG ORIGIN.

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Hematoporphyrin is simply hematin without the iron. It is found in the normal urine in faint traces (Garrod). This amount is increased, though not enough to color the urine, in various morbid conditions, such as measles and rheumatic fever. It has no clinical importance so far as we know in these minute amounts. When it occurs in sufficient amount to color the urine, causing hematoporphyrinuria, the act is significant and often ominous.

Hematoporphyrinuria is best known in connection with the use of sulphonal, trional, and tetronal. But besides these drug cases, the condition occurs as the result of various other toxemias.

T. K. Monroe[1] reports a case of periodical vomiting in a boy, aged seven years, occurring about every two months, and each attack lasting about a fortnight, accompanied with hematoporphyrinuria and acetonuria. The attacks continued for two years, and the patient finally died of the disease. He reports, also, the case of a woman, aged thirty-six years, who suffered from multiple neuritis and a pelvic exudate, accompanied with hematoporphyrinuria. She recovered in about seven weeks. Also a third case, that of a woman, aged twenty-six years, who suffered from hematoporphyrinuria after having become chilled while bathing at sea. In these cases there was no drug poisoning and no internal hemorrhage.

W. Langdon Brown and H. O. Williams[2] report the case of a married woman, aged twenty-two years, who had three attacks

[1] Quarterly Journal of Medicine, 1907-08, i, 49.
[2] Lancet, 1909, i, 1105.

of abdominal pain and vomiting with hematoporphyrinuria, lasting several weeks. In the last attack she had three epileptiform fits and became delirious and drowsy, but finally recovered. The authors collected other cases of hematoporphyrinuria, not due to drugs, but associated with gastro-enteric disturbance and apparently due to intestinal toxemia.

From the reported cases it would seem that hematoporphyrinuria, when not due to drug poisoning, is due, therefore, to some toxemia or to some internal hemorrhage.

The following case does not surely belong to any of these groups It is reported because of the exceptional opportunities which were furnished me for making blood and metabolism studies in connection with the progress of the case, through the courtesy and helpfulness of Dr. T. C. Roper, of the New York Hospital Laboratory, and of Dr. T. W. Hastings and Dr. Warren, of the Cornell University Medical College Laboratory.

Summary. Male, aged sixty-seven years. Apoplectic seizure with temporary hemiplegia, short excited and long confusional mental state, lasting about three months. Development of marked hematoporphyrinuria, lasting for two months. Seven nitrogen examinations, showing increase of kreatinin and rest nitrogen; no signs of hemolysis, no drug intervention, no known intestinal toxemia. Hematoporphyrinuria is evidence of a metabolism disorder, and not a sign of a serious blood condition.

Mr. J. T. J., aged sixty-seven years, married, two children; occupation, president and financier. The patient has been a very strong, rugged, hard-working man, never taking a vacation. He has never drunk alcohol in any form, nor tea or coffee; he has not used tobacco nor any drugs. His food habits are said to have been particularly intemperate. He would eat all kinds of food, including meat, in very great amount. About twelve years ago he had some heart trouble, for which he was sent to Nauheim for two successive years. He was relieved by these trips. He had an attack of vertigo in January, 1909. He recovered from this and continued his work.

On February 23, 1909, while at work in his office, he became confused and was unable to talk connectedly. An hour or so later he could not talk at all, and on attempting to do so would burst out crying. On attempting to walk, he was found to be paralyzed on the right side. He was placed in bed and slept during the night. The next day he tried to get up and dress, but was unable to do so on account of his right hemiplegia. He tried to talk, but failed, and his efforts would end in explosive crying. He had also some difficulty in swallowing. He was just able to sign his name to a power of attorney.

He improved slightly in the next week, and then went into a

semicomatose state, which lasted for two days, during which period he would at times arouse himself and become delirious. He came out of this coma and was then more quiet, but was confused and at times delusional, thinking that he was being persecuted and poisoned. He could speak now a little, but his speech was very indistinct, and he could not sit up or stand without help.

He again gradually improved and in about a month after the beginning of the attack he was able to be brought to New York. At that time he could talk a little and could sit and stand, but the fatigue of the journey set him back; so that when he reached here he was again in a condition of semicoma, from which he would occasionally arouse and become delirious—trying to get out of bed and showing evidences of hallucinations of sight and hearing.

I saw him first on March 25, two days after he reached the city. He had then quieted down somewhat, and responded to simple questions and recognized members of his family.

On examination, he showed absolutely no signs of a hemiplegia. His right arm and leg were as strong as the left. There was no change in the reflexes, either superficial or deep. There was no Babinski reflex; no ankle clonus; no disturbance of deep or superficial sensation. His only peculiarity was a tendency to hold the left hand in whatever position it was placed—a sort of catatonic state. His special senses were apparently normal, though his mental condition prevented careful examination. The temperature was normal; the heart sounds good; the pulse 70; the blood pressure nearly 200 mm. Hg, and but a little higher on the left than on the right. He had for three days Cheyne-Stokes respiration; the lungs were normal. The urine showed a trace of albumin and some casts; the amount was normal.

During the next few weeks his condition slowly and regularly improved. He had attacks of explosive and involuntary crying when any one came into the room, or when a question was asked, or when he tried to talk much. For the first few days he was often delirious at night, and talked constantly of murder and plots against him, and at times refused medication, saying that he was being poisoned.

At the end of the third week he had quieted down and was free from any distinct irrationality or delusion. He was at that time still unable to talk freely or to speak anything but short sentences. He recognized his family, but did not know where he was. He could not write nor apparently read. He did not remember where he was during the past winter; did not know where he lived, nor where he was at that time; did not know where his children were. He remembered having seen his daughter on that day, but not his wife. He had no appreciation of values, and

did not know how much it was costing him to live, or how much could be done with a ten dollar bill. He could sign his name with difficulty. He could not read except isolated words. He could not name objects seen, heard, or felt. He formed correct sentences, but was unable to connect them or make continuous statements. In other words, he was completely disoriented and had amnesia of the past and to some extent of the present. He had a certain form of aphasia, which seemed to be a part of his general amnesia and clouded intelligence. In more technical words, he had apraxia (loss of power to do things because of loss of knowledge how to do them) and agnosia (loss of memory of the use of an object). He did not, for example, know how to use a knife or fork or spoon, and had to be fed, although he had no hemiplegia and he knew the name of the object.

He gradually improved, and in about two weeks was better along nearly all lines. His speech was more coherent, but he soon wandered off and became confused.

On April 29, five weeks after he reached New York, he had got so that he could recall the past fairly well and could tell about his past life. He talked coherently, his explosive sobbing ceased, and his delusions of persecution disappeared.

He gradually regained all his mental functions, so that by the last of May, three months after his illness began, he was able to read and write and converse. All signs of aphasia, agnosia, and apraxia disappeared; his mind was clear, and there was also nothing in his condition which would suggest that he was a sick man, except that his mind worked a little more slowly than usual and was a little more easily fatigued.

In November, 1909, he was seen by me again. He was then well and had no hematoporphyrin in the urine.

Details of Physical Examination. The *hematoporphyrinuria* was first noted about April 1, and it lasted till late in May.

The urine on admission, March 23, showed a specific gravity of 1022; it was of acid reaction, dark amber color; a faint trace of albumin, hyaline and granular casts, and a moderate number of red blood cells were present; indican was increased; there was no sugar; the daily amount was about 1200 c.c. (Dr. Roper).

On April 1, the urine was noted to be a reddish amber color.

On April 9 the reaction to hematoporphyrin was obtained. At this time there were no red blood cells found in the centrifuged specimen. There was still a faint trace of albumin and there were a few hyalogranular and hyaline casts; amount, 1000 c.c.; specific gravity, 1018.

On April 20 all drugs were stopped and he was placed on a meat-free diet for about one week, but the hematoporphyrin continued to be present. It very gradually decreased in amount,

yet when the patient was discharged nearly well in May, there was still some present. The trace of albumin became of the faintest, and at the last there were only a few hyaline casts.

At the time when the hematoporphyrin was first found the patient was rather excited, and at times at night delirious, and he thought that people were trying to poison him. This condition cleared up in about a week (April 19).

The blood pressure on admission was nearly 200 mm. Hg. On the second day it was 158, and after this it ranged about 160 to 150; finally, April 20 to 25, it was 140.

The pulse was at first about 90 (84 to 104). After about three weeks it dropped to 72 to 80, and when discharged it was about 70 (66 to 72) (May 3). The temperature was normal.

The respirations were about 20 (16 to 22) and on the first few days were at times of Cheyne-Stokes character.

The Blood Examinations by Dr. Roper. On admission, March 24: Hemoglobin, 90 per cent.; leukocytes, 12,800; polynuclears, 70 per cent.; small lymphocytes, 22 per cent.; large lymphocytes, 5 per cent.; eosinophiles, 2 per cent.; basophiles, 1 per cent. April 12: Hemoglobin, 96 per cent.; leukocytes, 8600; polynuclears, 76 per cent.; small lymphocytes, 19 per cent.; large lymphocytes, 2 per cent.; eosinophiles, 2.5 per cent.; basophiles, 0.5 per cent.

A Wassermann test for lues was made in November, 1909, by Dr. Hastings. It was negative.

Drugs. On admission the patient was given once 15 grains of trional; nitroglycerin, $\frac{1}{150}$ grain every two hours; and potassium iodide, 5 grains three times a day. On March 25 he was given sodium bromide, 15 grains three times a day for one day. On March 26 he was given a 5-grain blue mass pill and Rochelle salt, 1 ounce, and the potassium iodide was increased to 15 grains three times a day. On April 1 he was given 2 compressed cathartic pills. From April 1 to April 20 he received sodium bromide, about 30 grains daily; 2 grains of calomel once; dilute hydrochloric acid, 10 minims three times daily for three days; and a laxative pill—but no other medication, and no sulphonal or other hypnotic. On April 20 all drugs were stopped.

Food. The patient was fed on milk, eggs, bread, stewed fruit, and later, the ordinary hospital dietary of meat and vegetables. He ate normally and moderately. The stools were normal apparently. At one period all meat was excluded from the diet.

Nitrogen Examinations. The total urine under a fixed diet was examined by Dr. Roper five times, and by Drs. Hastings and Warren twice.

The appended table shows the results:

	Total N.	Urea N.	Ammonia N.	Uric or Purin acid N.	Kreatinin N.	Undetermined N.
Hospital Diet,	10.1	8.2	0.4	0.041	0.86	0.6
April 17 to 18, 1750 c.c.	...	81.2	4.0	0.43	8.5	5.9
April 21 to 22, 1200 c.c.	8.56	76.0	6.0	2.4	3.4	12.2
Drug free diet,	8.4	6.9	0.3	0.08	0.8	0.32
April 23 to 24, 1300 c.c.	...	82.15	3.6	0.95	9.5	3.8
Meat-free diet,	6.1	5.1	0.27	0.09	0.49	0.15
April 26 to 27, 750 c.c.	...	83.6	4.4	1.5	8.0	2.5
Meat-free diet, April 28 to 29, 1100 c.c.	6.8	5.7	0.2	0.05	0.61	0.24
Meat-free diet,	8.1	6.4	0.27	0.13	0.75	0.55
April 29 to 30, 1320 c.c.	...	79.0	3.3	1.6	9.3	6.8
Meat-free diet, May 12 to 13, 1300 c.c.	9.82	83.7	5.2	2.4	5.8	2.9
Normal	10–14	85–90	3–5	0.9–1.5	3–4	2–6

The upper figures represent the actual amounts, the lower figures the percentage distribution of nitrogen.

Dr. Roper states: "All of these specimens were brownish in color, showed two bands corresponding in position to those of oxyhemoglobin. These were not altered by the addition of glacial acetic acid or reducing agents. No reactions for blood pigment could be obtained. Acidifying with strong HCl changed bands to those of acid hematoporphyrin. Precipitation with BaCl and extraction with acid alcohol after washing with water and absolute alcohol gave a brilliant pink fluid, showing two banded spectrum of acid hematoporphyrin, which changed on making faintly alkaline to the four banded spectrum of alkaline hematoporphyrin. The urine also showed the absorption band of urobilin."

The clinical history would indicate that the patient suffered from an incomplete cerebral thrombosis, involving probably the left frontal lobe. This diagnosis was concurred in by Dr. Allen Starr, who saw the patient in consultation.

The psychosis which resulted was of the confusional and toxic type seen in persons at any age; but the temporary hemiplegia, the agnosia, and apraxia showed that there must have been more than a functional and toxic disturbance.

The study of the blood and urine show that the hematoporphyrin was not the result of a breaking up of blood cells, either living or

from a brain clot, for there would then have been some hematin or iron-bearing product. It leads to the conclusion that perhaps the hematoporphyrin in drug cases is due to metabolic (liver?) disorders, and not to a hemolysis, as has been usually supposed.

This view is supported by the fact that in hematoporphyrinuria due to drugs the liver cells show fatty degeneration.

The significance of hematoporphyrinuria apart from drug poisoning and perhaps from intestinal toxemia is not well known.

It has been demonstrated by Garrod and by Soberheim[3] that hematoporphyrinuria may be present in urine after the dark color has disappeared and that, in other words, the color of the urine in this condition is not due to the hematoporphyrin, but to other abnormal pigments. It may, therefore, be that hematoporphyrinuria may be present in the urine without any change in the color. It may be inferred from the present case that its presence is not of so ominous significance as it seems to be in drug cases.

A METABOLIC STUDY OF MYOTONIA ATROPHICA.[1]

WITH THE REPORT OF TWO CASES.

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The case which forms the basis of the following considerations is interesting in several connections: (1) Because it represents a rare clinical entity; (2) because it showed in the light of metabolic study, some findings more marked than is customary in analogous conditions; (3) because one of the findings is now reported for the first time in connection with the disease; and (4) because such metabolic observations seem to throw light on the classification of the condition and suggest a means of arriving at a true diagnosis in obscure diseases of this nature.

A. B., aged thirty-seven years, white, female, married

Chief Complaint. Stiffness in the shoulder, elbow, and knee; pain in the back, and difficulty in walking

Family History. Negative, except that the patient is fairly confident that a sister who died in childbirth had an involvement of the hands similar to hers, but was otherwise healthy.

[3] Deut. med. Woch., 1892, xviii, 566.

[1] Read at a meeting of the College of Physicians of Philadelphia, December 7, 1910.

Social History. She menstruated at the age of fourteen years, has been regular ever since, and was married at the age of twenty years. She has three children living, two of them healthy, and has had one miscarriage; one child died at birth with convulsions. A boy, aged about ten years, has hydrocephalus and is in a school for feeble-minded children. The patient states that he has some similar difficulty on opening his hands after tightly closing them, but this did not appear when he was examined. She does housework and formerly drank a small quantity of beer at intervals, but has had none for ten months; takes coffee and tea once daily.

Medical History. She has had measles and pertussis when a child, and diphtheria twelve years ago. She has never been ill in bed except for confinements and was well until the onset of the present trouble seven years ago.

Present Illness. Seven years ago she noticed a weakness in her knees which prevented her from going up stairs readily, although she otherwise felt well. With the aid of a little support she could manage easily and had no difficulty in walking on the level. The weakness in her legs became slightly more marked and one year later, after a childbirth, she developed a dull aching pain in the back. This pain has persisted on and off up to the present time. The weakness of her legs slowly increased so that four years ago she began to place her hands on her knees when she wanted to rise from a sitting posture. Three months ago she noticed some weakness in her left arm and shoulder which prevented her raising her arm over the back of her head and caused her to lean forward to comb her hair. This last development she thinks came on rather suddenly; she says she went to bed well one night and got up the next day weak, as described. She says that long before the onset of her attack she had difficulty in opening her hand after closing it tightly. When she presses her tongue against her front teeth, she cannot for a few seconds protrude it or talk. This condition she says is of recent development (a matter of a few months), though she does not know exactly how long. Her bowels have been a little loose, but she has had no difficulty in urination.

Physical Examination. This shows a rather adipose woman of large build, prominent forehead and good intelligence (Fig. 1). There is marked prominence of the seventh cervical vertebra posteriorly and the back, as a whole, is round. The tongue shows a slight moist fur and is easily and evenly protruded except as above described. The eyes give normal motions and reactions, except that the eyelids can be opened with ease against the resistance of the patient. Dentition is poor and teeth are poorly cared for.

The radial pulse is regular and of good volume, rate, and tension; the cardiac outline is normal and the sounds are good without murmur. The lungs are apparently normal. The liver extends from the fifth rib to the costal margin. The abdomen is large and relaxed, showing numerous striæ, but otherwise is negative.

Reflexes and Musculature. The eye-lids can be easily opened against the patient's resistance as mentioned, but the control of the muscles of expression is good, and there is no asymmetry of the face. No weakness of the temporals or masseter can be developed and the mouth can be drawn equally to either side, but when told to smile, the angles are not much retracted. The head is held markedly forward during the acts of sitting down or getting up. The neck is rather plump and there is a very slight swelling of the

FIG. 1.—Photograph of the patient, showing the suggestion of ptosis from weakness of the levatores palpebrarum.

thyroid which, according to the patient, has existed in its present state for years. The sternocleidomastoids cannot be clearly felt and turning the head in various positions does not make them conspicuous. The scapulæ are both prominent on the inner edges, especially the left scapula, which protrudes markedly when the left arm and shoulder are moved. There is some evident wasting of the associated muscles, especially visible on the inner side of the scapula, but adiposity masks its exact distribution. Anteriorly the chest seems flat in the upper part and the pectorals seem less developed than

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIGS. 2, 3, 4, and 5.—The pictures of the patient's hand show the successive positions assumed in the attempt to open it after forcible closure.

normally. There is no evident wasting in the deltoid, arm, or forearm region. The biceps and triceps reflexes are greatly diminished or absent. The patient has diminished but moderate strength in both arms (for acts not involving the shoulder girdle), but the shoulder muscles on the left are so weak that the left arm cannot be actively raised high enough to place her hand on her head. Passive movement of all limbs, however, is everywhere free. The hands are well formed and the fingers rather tapering. The power of contraction of both hands is below par and when closed as firmly as possible there occurs, for a few seconds, an inability to open the hands again (Figs. 2, 3, 4 and 5). When opening them, the fore and middle fingers are extended first, followed by the third and fourth in a slow athetoid manner, after which the thumb is extended and then finally the whole hand and palm are opened flat, Sometime the third and fourth fingers are opened first, but the general movement is always the same. There is also a tendency for the thumbs to be held adducted across the hands.

The power in each leg is everywhere below normal. The left is larger than the right and has been so, she says, since the birth of her last child when she had "milk leg." It is not œdematous. The right seems to be slightly less than normal in size below the knee, there is relatively little calf, for the general build of the limb, and the muscles of the calf seem rather soft and flabby on palpation. The thighs seem smaller than they should be and there is, possibly, some flattening of the vasti externi. The left leg below the knee is, perhaps, slightly firmer to palpation than the right, but the patient feels that the power in each is about equal. The buttocks seem to be less protuberant than in health, but the gluteal crease is equal on each side and adiposity masks the true condition of the muscles here. On rising from a sitting posture, the patient places her hands on her knees to obtain greater support. In getting up from the floor she rises on one knee, then gets on all fours, finally puts out one leg and by the support of a hand on a chair, for example, rises. She cannot get up without this external aid. In walking the alignment of the feet is rather poor, though not incoord nate. The patellar jerks are diminished, though present, and there is neither Babinski's sign nor ankle clonus.

Urine. Acid, with a granular sediment, a few white blood corpuscles, and some epithelium.

On October 27 the systolic blood pressure was 96 mm. Hg. and the diastolic 65.

On October 29 the eye fundus showed no change though there was beginning opacity of both lenses.

The leukocyte count was never higher than 8650 and the differential count was normal. Hemoglobin, 88 per cent.

The patient stated (April 28, 1910) that in swallowing she sometimes has some difficulty, which is of fairly recent development.

On April 28, 1910, the electrical reactions were tested by Dr. J. W. McConnell and found to show some diminution of response, about equal everywhere, but there was no indication of the reactions of degeneration.

Weight, on October 14, 1909, 153 pounds (69.54 kilos).

Weight, on October 22, 1909, 157 pounds.

The patient is a sufferer from psoriasis which is worse in summer. On August 23, 1910, about ten weeks since last previous examination and about ten months since she first presented herself, she said she felt that she was slowly growing worse and had recently developed some unsteadiness of station which she thought was not due to weakness. She complained of some slight difficulty in swallowing. On examination, her pupillary reactions were found as before and her station with the eyes shut was good. On rising, however, or on stopping suddenly when walking, she would, at times, show the above unsteadiness. She also complained of increasing difficulty in performing her work. The thenar and hypothenar showed some suggestion of atrophy though it was not marked.

Subsequently to the completion of the metabolic studies upon the present case, here to be reported, I had the opportunity to examine another instance of the same condition. It occurred at the Philadelphia General Hospital in the service of Dr. D. J. McCarthy who has very kindly given his permission to have it included in the present paper. For this courtesy, I wish to express his appreciation.

Social and Medical History. The patient is a white male, aged forty-two years, formerly married, but only for a few months, when he left his wife for infidelity. He had no children. His family history is negative for any analogous condition, though one brother now has phthisis and one sister cannot talk loud; possibly as the result of diphtheria and some operation connected with it. The patient's birth was normal, and he was the fifth member of the family. He says that he had repeated attacks of diarrhœa until two years of age, when he developed "St. Vitus' dance." At intervals of two years afterward, and until he was twenty-six years old, he had recurrent attacks of it, for which he took Fowler's solution, up to thirteen minims three times a day, which always relieved him. Otherwise, he says, he always felt well, except that at the age of sixteen years he had "bronchitis," which confined him to bed for a month. At one time he injured his eyes on a bet by looking at the sun for five minutes at 3 o'clock of a bright afternoon. This wager resulted in blindness, which lasted three weeks, since when he has worn glasses. He says that from fourteen to nineteen years of age he was subject to headaches, which were relieved for five years by the removal of a nasal polyp, but they then recurred, and he now has a slight frontal headache much of the time. His voice is somewhat nasal. He denies all venereal history.

Present Illness. The onset of his present trouble dates back seventeen years, when he was a nurse in a large hospital. A fall called his attention to the fact that his feet flopped in walking and that his legs seemed weak. His knees soon became affected, causing him to fall more frequently and his progress from that time has been steadily worse. Ten years ago he first developed some symptoms of Thomsen's disease, seven years after the weakness in his legs began, and now experiences frequently a "locking" of the limbs when he rises from sitting or begins almost any act involving the arms or legs.

Physical Examination. Examination shows a well-nourished and intelligent man of 5 ft. 7 in. He is "pot bellied" from accentuation of the dorso-lumbar curve. The facial expression is intelligent and tranquil. The extraocular movements are apparently normal though there may be some slight weakness of convergence. The pupils are equal and react well to accommodation, but sluggishly to light. There is some ptosis when the patient looks before him. The orbiculares and levatores palpebrarum are markedly weak and there is twitching of fasciculi of the orbicularis palpebrarum on the left which, he says, has been present for seven years. There is slight weakness of the buccinators, but not of the orbicularis oris. The tongue is protruded evenly and easily in midline and is clean, without fissure, atrophy, or tremor. The sternocleidomastoids are greatly atrophied and when the head is put back it cannot be brought forward without great effort. There is free passive and active motion of both arms and coördination is good.

There is no atrophy of the subscapular group on either side, but both supraspinati show some atrophy, especially on the left. The left deltoid shows marked atrophy, but the right apparently shows none. There is slight atrophy of the biceps and triceps on the left, and a very little on the right. There is considerable loss of extensor power on the right. Flexor power of the right arm is good, of the left moderate. There is moderate atrophy of both forearms, especially of the ulnar flexor group, and the grip is reduced 50 per cent. Both thenar and hypothenar eminences show slight atrophy, and it is moderate in all the interosei. The triceps reflexes are present on both sides on reinforcement, but the biceps can be obtained only on the right.

The legs everywhere show wasting, though the right is slightly larger than the left. There is a corresponding and moderate loss of power in both legs. The knees are both hypotonic and the knee caps protrude anteriorly. The vasti externi share in the general wasting and probably suffer slightly, though not markedly, more than the rest of the leg muscles. The flexors of the foot show weakness. There is no knee jerk, ankle clonus, or Babinski sign, and there is no tenderness over the nerve trunks. The toes flex to plantar irritation.

The station with the eyes open or shut is good, though there is some instability because of weakness in the legs. There is a steppage gait. The hands show the myotonic feature of inability to relax for a few seconds after forcible closure and finally relax in a slow athetoid manner. The legs "lock," that is, become fixed in position when he starts to walk, as do the arms also for certain acts, and when the legs are affected his whole body remains apparently motionless for an instant. When the limbs are locked, he muscles concerned are contracted.

The intrathoracic and intra-abdominal organs present no important abnormalities, though both testes show atrophy, especially the left. The patient has no sexual desire and erections are involuntary. He cannot retain his urine as long as normally.

A review of the bibliography reveals the fact that but one report of this interesting condition has been made in American literature, so far as the author can ascertain,[2] although in all a total of twenty-five cases have been reported by foreign observers. In 1897, Pelizaeus called attention to a case evidencing the phenomenon of Thomsen's disease (myotonia congenita) with symptoms of muscular atrophy, and another instance was reported in 1899, by Nogues and Sirol. In 1900, Hoffman contributed a study which showed that muscular atrophy occurs in approximately 9 per cent. of cases of Thomsen's disease, since when there has appeared a number of articles recording the association of muscular atrophy with manifestations of Thomsen's disease and sometimes of myasthenia. Probably the most complete exposition is contained in a monograph by Batten and Gibb.[3] Various names have been applied to this syndrome, the present nomenclature of which is redundant and confusing to the student. Rossolimo first used the term "myotonia atrophica" because it serves shortly to describe the salient features, but this bears an unfortunate resemblance in sound to myotonia congenita (Thomsen's disease), and to myatonia congenita or amyotonia congenita. Other terms employed have been "myotonia with muscular atrophy" (Lannois), "muscular atrophy with the electrical reactions of Thomsen's disease" (Lortat, Jacob and Thaon), "Thomsen's disease with muscular atrophy" (Nogues and Sirol), "Atypical forms of Thomsen's disease" (Pelz), "Muscular atrophy with slow relaxation of muscles" (Kleist), but myotonia atrophica is that most frequently applied. The term "myotonia" is objected to by some, since it is occasionally used as synonymous with Thomsen's disease and, similarly, the use of the adjective "atrophica" has found disfavor because the order of events is not always as the title suggests, that of dystrophy followed

[2] Hunt, Ramsay. Myotonia Atrophica, Jour. Nervous and Mental Diseases, 1908, xxxv, 269.

[3] Brain, 1909, xxxii, 187.

by atrophy and also because the atrophy may not occur in the muscles affected. It is not the purpose of this article to consider at length, as has been well done elsewhere, the clinical features and variations of this disease, but the rarity of the condition demands, perhaps, a few words of exposition as to the leading characteristics.

There seems to be a familial tendency in regard to its occurrence, as might be expected in view of the hereditary nature of Thomsen's disease, but the etiology is at present quite obscure. The disease more commonly affects males between twenty and thirty, and the myotonic feature usually precedes the atrophy, though, as above indicated, this order is by no means constant. The sex of the first case here reported is interesting, since the few recorded cases leave no doubt that the disease is commoner among males. In only 3 out of 20 cases were the patients women, and in 2 of these the symptoms were so slight as to have escaped observation until it was attracted by the presence of the affection in a more marked degree in other members of the family. The condition begins insidiously, with or without a previous history of myotonic symptoms and with varying degrees of incapacity. When the case has developed, examination reveals muscular atrophy in the face, especially in the orbicularis palpebrarum and orbicularis oris, with occasional involvement of the mandibular group or the sternocleidomastoids. Of the upper extremities the forearm may be wasted, but the hand muscles are usually well preserved. The vasti of the thigh generally show atrophy, as do sometimes the peroneal and anterior tibial group, but elsewhere in the body the musculature escapes, except for a rare affection of the laryngeal. That the distribution of the atrophy may vary is well illustrated by the case of Steinert's that came to autopsy in which, contrary to the usual distribution, the hands and general musculature of the body were involved. According to Batten and Gibb, the muscles of the shoulder and upper arm are rarely affected, but in a few cases there has been noticed a wasting of the supraspinati and infraspinati. The myotonic symptoms are usually not widespread and are generally best or solely exhibited in the grasp of the hand. Flexion of the fingers and hand around an object is usually well performed, but on attempting to relax, a considerable interval must elapse before the hand can be straightened out; and even then this may be accomplished by a somewhat athetoid contortion. The greater the force of the grasp, the greater the difficulty of undoing it, though, after repeating the act a few times, it is finally easily accomplished. The difficulty of relaxation is not due to weakness of the extensors. The tongue may occasionally show involvement and there have been recorded instances in which this disability affected the upper arm and neck, but the legs are usually but slightly implicated. There are also instances in which perfectly typical cases of myotonia congenita have been affected with

muscular dystrophy (Steinert), but in these the myotonia preceded the atrophy, had existed from childhood, and was widely distributed. Collins[4] has described a curious condition in which there were present extensive myotonic symptoms or purposive movements which affected the whole body and were accompanied by some hypertrophy. The myotonia, however, tended to increase as long as the movements were kept up and there was no atrophy, no myotonic reaction, or familial history. There also seemed to be some evidence of hysteria.

The electrical reactions in the disease under consideration, show a diminution of irritability to the faradic current, but nothing more. The pathology of the disease is confined to the study of one or two cases by Rossolimo and Steinert, the latter of whom has recently made a complete examination and has shown that the condition of the muscles is the same as in other myopathic cases. He found, however, degeneration of the posterior column in the lumbar region which could be traced up into the cervical, but he regards the cord condition as purely incidental. He agrees with Hoffman that these cases are true instances of Thomsen's disease and sums up his conclusions as follows: "The so-called 'myotonia atrophica" is a condition in which a typical case of Thomsen's disease is affected with muscular dystrophy. The clinical feature of this atrophy is sharply defined and highly characteristic. It occurs only in this form in Thomsen's disease. The comparative frequency of impotence and atrophy of the testicle should be emphasized." More recently a suggestive case in a female, aged thirty-four years, has been reported by Steinert in which the symptoms of the menopause had occurred. Sometimes the myotonic features are late in appearing and occasionally the myotonia has followed myopathy. Batten is inclined to place these cases in the great group of myopathies, but in his own words, further clinical and pathological experience is required before any definite statement can be made.

It will be seen from a consideration of the above that the present case can be best categoried by inclusion in the group designated myotonia atrophica, and I wish to express my obligation to Dr. William G. Spiller for helping me to a diagnosis and for emphasizing the neurological interest involved.

When the patient first presented herself at the dispensary for treatment, it seemed that observations on the general metabolism, creatinin, and calcium in particular, would be of interest and might help to classify the condition, especially in view of the results of some similar investigations conducted recently on a case of myasthenia gravis.[5]

[4] Postgraduate, New York, 1905, xx, 516, 519.

[5] Pemberton, A Study of the Metabolism of Myasthenic Gravis, with a Suggestion Regarding Treatment, Amer. Jour. Med. Sci., 1910, cxix, 816.

In this last instance a rather low creatinin output was observed together with a very marked loss of calcium. A low creatinin output in myasthenia has been noted by Spriggs, though not so low as in the case referred to, but the calcium determinations just recorded were then made for the first time in this condition and were of considerable interest. The loss of calcium in seven days amounted to over 9 grams, and after the administration of this element for over two years by Dr. William G. Spiller, under whose care the patient was, recovery was practically complete and the patient now feels himself well. A consideration of this and of the other close relations which have been shown to exist between calcium and various muscular phenomena, emphasized the advisability of extending the observation to other muscular aberrations.

As far as I am aware no metabolic study of the calcium metabolism is on record in regard to either muscular dystrophy or Thomsen's disease, and the present case seemed a fitting one in which to attempt such a determination. Indeed, no attempt has been made to approach the question from any standpoint other than the clinical, beyond the suggestion made some years ago that veratrum poisoning in frogs caused somewhat similar phenomena on electrical stimulation, and that the condition might be referable to some metabolic disturbance. After a day or two of observation in the dispensary the patient was admitted October 7, 1910, for the purpose of diagnostic and metabolic study to the service of Dr. Joseph Sailer, at the Presbyterian Hospital, to whom appreciative acknowledgment is due for the privilege of undertaking and reporting the work upon her when in the ward.

She was placed upon a generous weighed diet, which was adapted to suit her particular demands, and analyses were made over a period of five days on the urinary nitrogen, creatinin, and calcium and the fecal nitrogen and calcium. The patient had been living under circumstances of rather poor hygiene, had been worried about herself, and had been expending much effort in the care of her home. When she was put at rest in bed in the hospital, the physical quiet and generally favorable conditions reduced the strain from which she had suffered and improved her spirits and stimulated her appetite. The results were that she gained two pounds in five days and showed a nitrogen retention of 28 grams. In this same period the calcium metabolism presented almost a balance showing a trifling loss of 0.5668 grams.

The creatinin output in the case now under consideration was found to average 0.40278 grams per diem which gives the creatinin nitrogen expressed in terms of total urinary nitrogen as 1.77 per cent.

In a series of cases of various perversions of muscular function, including dystrophy, Spriggs[6] observed an output of creatinin ranging from 0.5 gram to 3 grams, but in none recorded was it so

[6] Quarterly Journal of Medicine, 1907, i, 63.

low as 0.40278. In myasthenia gravis (my case[7]), the creatinin output was 0.39155. Sprigg's adult case of dystrophy gave a daily average of 0.53 grams which is, however, a creatinin percentage as above of 1.7.

It has been found useful to observers generally to express the daily creatinin elimination in milligrams of creatinin per kilo of body weight and this ratio is called the creatinin co-efficient. In health it varies from 7 to 11 milligrams of creatinin nitrogen. In Sprigg's series he found the lowest co-efficient in the dystrophy cases which gave 2.2 and 4 milligrams respectively. The former of these was in a boy of only fifteen and three-quarter years.

Levene and Kristellar[8] have also observed very low creatinin co-efficients; and one adult, aged twenty-one years, in their series of five cases of muscular dystrophy gave a co-efficient of only 0.7, but observations were made over a period of two days only and such an extremely low result is very exceptional. The other adults in their series averaged 3.16. Similarly other observers have recorded low results in dystrophy and in a number of pathological conditions, and Myers has found a co-efficient of 2 in two very discrepit old women studied by him. This is a very low figure, however, for adults, and the case now being reported is noteworthy in that the creatinin co-efficient was 2.0139.

This was not suggested, *a priori*, by the condition or the general activity of the patient, who is able to care for her own home and a family of five. While there was plainly atrophy of tissue in the scapular region, it did not seem excessive, and was further masked by the general adiposity. There was no pseudohypertrophy. A consideration of these results was an aid in classifying the disease from which the patient suffered and indicated more strongly than could clinical observations alone, its probable nature as well as the degree of involvement. It was possible to eliminate myasthenia gravis with relative ease, although in the past myotonia atrophica has been so diagnosed; but had there been more doubt as to this, a consideration of the calcium balance would have thrown weight in the same direction. This last needs corroboration by studies of other cases, but it is cited to indicate the use to which could be put the slowly increasing number of metabolic observations in these states, and the importance of studying such doubtful affections from a dynamic point of view.

More complete observations on the creatinin and calcium metabolism in dystrophy and several muscular perversions of function are now being made.

Conclusions. As far as the study of one case can be relied upon it may be said that there is apparently no significant disturbance of the calcium output in muscular dystrophy; at least, in the presence of those phenomena which suggest Thomsen's

[7] Amer. Jour. Med. Sci., 1910, cxl, 256. [8] Amer. Jour. Phys., xxiv, 45.

disease. This can probably be also inferred, though not surely, in regard to Thomsen's disease "per se." The creatinin output, however, under these circumstances may be considerably reduced and the creatinin co-efficient conspicuously low. A consideration of the calcium, creatinin, and general nitrogenous metabolism as recorded here, and in myasthenia gravis, may lead to information of value in classifying doubtful conditions of this nature and localizing the perversions of function. It seems that such investigations should be more frequently undertaken in careful clinical s udies.

Finally, I desire to express, with appreciation, my indebtedness to Dr. James E. Talley for many courtesies shown me in the wards of the Presbyterian Hospital.

DIET.

Oct. 13	Eggs.	Bread	Milk	Rice.	Butter.
B	88	62	12		
D	84	70	12	65.1	.55
S	85	51	12		
Oct. 14					
B	89	90	12		
D	91	70	12	57.2	99
S	89	65	12		
Oct. 15					
B	89.75	72	12		
D	85	80	12	63.90	32
S	89.50	67	12		
Oct. 16					
B	72	79	12		
D	96	72	12	69.70	89
S	84	76	12		
Oct. 17					
B	112	78.5	12		
D	97.50	80	12	51.60	60
S	109	27.5	12		
Total . .	1350.75	1040.0	180	307.50	335

PERCENTAGE CONTENTS OF FOODSTUFFS IN CA AND N.

	Per cent. calcium oxide.	Per cent. nitrogen.	
Eggs	0.122	2.008	
Bread	0.041	1.265	
Milk	0.184	0.574	(1031 sp. gr.)
Rice	0.0145	1.110	
Butter	0.030	0.080	

TOTAL FOOD INGESTED.

		Grams.
Eggs	Calcium	1.1771
	Nitrogen	27.1231
Bread	Calcium	0.3045
	Nitrogen	13.1560
Milk	Calcium	7.8049
	Nitrogen	34.0873
Rice	Calcium	0.0445
	Nitrogen	3.4143
Butter	Calcium	0.1073
	Nitrogen	0.2680

URINARY FIGURES FOR EACH DAY.

		Grams.
Oct. 14	590 c.c.	
	Creatinin	0.300
	Ca	0.1257
	N	6.720
Oct. 15	800 c.c.	
	Creatinin	0.386
	Ca	1907
	N	8.6240
Oct. 16	410 c.c.	
	Creatinin	0.2695
	Ca	0.1508
	N	4.6592
Oct. 17	1100 c.c.	
	Creatinin	0.5742
	Ca	0.2392
	N	12.0102
Oct. 18	1075 c.c.	
	Creatinin	0.4842
	Ca	0.2608
	N	10.2256

URINARY TOTALS.

Creatinin	2.0139
Calcium	0.9672
Nitrogen	42.2390
Ca in total feces	9.0047
N in total feces	7.5413
Total ingested calcium	9.4041
Total excreted calcium	9.9719
Negative calcium balance	0.5668
Total ingested nitrogen	78.0476
Total excreted nitrogen	49.7821
Positive nitrogen balance	28.2655
Daily average of creatinin excreted	0.40278
Total creatinin excreted	2.0139

Creatinin co-efficient = milligrams of creatinin (daily) nitrogen per kilo of body weight = (normally) 7 to 11 milligrams.

Present ratio	0.149713	0.002138
	69.54	

The creatinin co-efficient in the present case is, therefore, 2.138 milligrams. The figures for the creatinin co-efficient are made up on the lowest body weight; they would be even less if made up on the average body weight or on the greatest body weight attained during the experiment. The percentage contents of the foodstuffs in Ca and N was taken from "A Study of the Metabolism of Acromegaly."[9]

[9] Edsall and Miller, Univ. Penna. Med. Bull., xvi, 143.

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CHRONIC INFLUENZA AND ITS RELATION TO NEUROPATHY.

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MY thesis is that influenza may be and frequently is a chronic intoxication.

The specificity of influenza was discovered in 1902, by Pfeiffer, more than four hundred years after epidemics of the disease were first accurately described. Most authorities state that the rate of mortality is very low, and the disease has presented little of general interest aside from its pandemicity, vagaries of onset and manifestations, and its multiplicity of complications. The mode of invasion is conceded to be through the respiratory tract, and the organism is usually found in the bronchial and nasal secretions. The bacilus often persists in secretions after subsidence of symptoms in severe cases. I have been much impressed with the belief that influenza might be a chronic, as well as acute infection, or, at least, a chronic intoxication, and my beliefs, while not proved by extensive clinical experience and data, have, at least, been partially corroborated by the general history of many cases of "grippe," reported by reliable investigators. In explanation of the frequent occurrence of Bacillus influenzæ in the secretions of persons in normal health, or suffering from some other disease, such as tuberculosis, scarlet fever, measles, etc., attention may be called to the analogous occurrence of the causative organism of enteric fever, diphtheria, and cholera in persons not suffering from these diseases.

In order to throw more light on the cause and dissemination of epidemic influenza, B. Scheller made examinations of a large number of persons suffering from epidemic influenza, as well as apparently normal persons in Königsberg during the winters of 1906-07, 1907-08, 1908-09, and the summer of 1908. Swabs from the throats of cases diagnosticated clinically as influenza, cases of pulmonary tuberculosis, and normal individuals were examined, microscopically and culturally, for Bacillus influenzæ. During an epidemic of influenza in the winter of 1906-07, 80 per cent. of the 56 cases of influenza showed the presence of Bacillus influenzæ in pure culture in more than one-half the cases; 8 cases wrongly diagnosticated as tuberculosis, and 4 of pneumonia showed pure cultures of Bacillus influenzæ. Of 109 normal persons examined, 25 (24 per cent.) were found to be "carriers" of Bacillus influenzæ, 15 of these giving a history of at least one previous attack of the disease.

Osler, in his monograph on influenza, concludes that "since the late severe epidemics it has been the fashion to date various ailments or chronic ill-health from the disease." In many cases the deduction is certainly correct. It is astonishing to note the number of patients who have been crippled in health for years after an attack.

Chronic influenza in many respects certainly bears a close similarity to tuberculosis, and I have no doubt that many cases of chronic capillary bronchitis, pneumonia, bronchiectasis, etc., in which the disturbing factor was Bacillus influenzæ, have been diagnosticated tuberculosis. This has, in a way, been confirmed by my study of three cases, which clinically presented symptoms and physical signs of tuberculosis, but in which the tubercle bacillus could not be isolated.

At autopsy the following results were found:

Case I.—Pericarditis with serous effusion; bronchiectasis.

Case II.—Carnification of the tip of the right lower lobe of the lung; hepatic enlargement, non-caseating nodules; complete fibrosis of the ovaries; and intramural fibrosis of the uterus.

Case III.—Capillary bronchitis; atheroma of the aorta; sclerotic endocarditis; fibrosis of the ovaries, and catarrhal enterocolitis.

I admit that the pathological findings in these cases are as insufficient and indefinite as the clinical diagnosis of tuberculosis was justifiable, although the organism was not found. The pathological results were such as we should expect in the cases which have been selected from clinical reports in the vast amount of literature. Attention is especially directed to the last two cases which presented a diffuse fibroid degeneration of the ovaries. This was certainly non-tuberculous. *Could it result from chronic influenza?* Authorities have always emphasized the distressing effects of "la grippe" on the female genitalia. No disease is more to be dreaded as an

intercurrent affection during pregnancy or the puerperium, because of the frequency of abortion and the occurrence of menstrual irregularities.

F. T. Lord, the pioneer in the study of influenza as a chronic disease, has written an extensive paper on the pathological and clinical similarity and confusion of influenza with tuberculosis, during epidemic and interepidemic periods. Jacobson, by injecting influenza bacilli with streptococci, and Slatineano, by injecting them with lactic acid into laboratory animals, claim to have obtained virulent cultures, capable of killing animals. "It is possible in patients with Bacillus influenzæ in the sputa to get clumping of the bacilli suspended in normal saline solution (one-tenth or one-twentieth) of their blood serum." The results are inconstant.

Cantani also claims positive results, but his work has not been confirmed. The pathogenicity of Bacillus influenzæ has been substantiated by exhaustive bacteriological and biochemical studies. Although the results of animal inoculation are unsatisfactory, "the impression is irresistible that the influenza bacillus is pathogenic for man when, in sputum preparations or stained sections from the lungs of patients who have died of bronchopneumonia the bacilli are found in enormous numbers, both within and without the cells, to the practical exclusion of other organisms." Within the last few years the organism has been found as the apparent sole infecting agent in several extrapulmonary regions. Heroosky obtained pure cultures of Bacillus influenzæ from the pus of acute suppurative cholecystitis. Albrecht and Ghon found influenza bacilli as the only organism from a phlegmonous inflammation of the arm. Meunier, Nauwerk, and many others, report that the bacillus appeared to be the sole apparent cause of meningitis.

In man, therefore, the influenza bacillus must be regarded as capable of producing pathogenic processes without the aid of other organisms. The influenza bacillus must be regarded as the most important cause of a large number of cases of respiratory infection (acute and chronic) during the interepidemic periods; and as a contributing cause in many other cases when found mixed with the pneumococcus, Micrococcus catarrhalis, and other organisms

Patients may carry the organism in enormous numbers for years in their sputum, just as they have been shown to carry other common representatives of the flora of the respiratory tract. The frontal, ethmoid, and maxillary sinuses are frequently infected and act as the nidus of infection in chronic cases. Many physicians have observed cases of intermittent fever occurring periodically in which the diagnosis has been well-nigh impossible, even when assisted by chemical and bacteriological tests. Could these cases be acute exacerbations of a chronic infection or intoxication by Bacillus influenzæ?

Cerebrospinal meningitis while usually acute, may be intermittent or chronic, and Diplococcus intracellularis meningitidis can be isolated in pure culture by spinal puncture. Bacillus influenzæ has always shown a predilection for the nervous system. Numerous cases of meningitis have been reported, but it was not until a few years ago that the organism was isolated from the spinal fluid in influenzal meningitis. Certainly, if the organism can produce and be isolated from the exudate of spinal meningeal inflammation, we must presume a diffused hemotogenous dissemination. The diplococcus of Weichselbaum, producing acute or chronic meningitis, protects from recurrence. Influenzal infections do not protect, but rather predispose to recurrences. This, together with the clinical history of prolonged indisposition, with exacerbations at irregular intervals, is axiomatic evidence of chronicity.

Case I.—Mrs. P., female, white, aged sixty-two years, born in Virginia, has lived in Washington for the last fifty years. She gives history of no illness influencing the object of this report. She has had frequent colds in winter of each year for the last fifteen, before which time she was unusually hardy. In 1894 and 1895 she suffered from intermittent earache for several months; attacks being accompanied by headache and fever. The ear finally began discharging pus, and after a few weeks' treatment the discharge ceased, but the patient has since been quite deaf in the affected ear.

She came to me in December, 1907, suffering from what I presumed to be influenza, presenting the following symptoms: severe headache, lumbar pains, chills, fever, and cough, with mucopurulent expectoration. I gave the usual treatment for "grippe," to which she responded promptly. On the second day after leaving her bed she washed clothes all day, and on the following day I was again called.

The patient presented the same symptoms as before, but the cough was much more distressing and the expectoration profuse, fetid, and greenish yellow. The sputum examined for Bacillus tuberculosis was found negative. Urinalysis showed a slight trace of albumin.

Physical examination of chest showed numerous small, moist rales all over the chest, especially at the base, and bronchial fremitus. The breath sounds were harsh and arrhythmic at the base. The leukocyte count was 8300.

After remaining in bed several days under treatment, she was somewhat improved, but complained of great weakness, mental hebetude, indefinite neuralgic pains, and she looked apathetic. For two weeks she improved slowly, when, being exposed to damp, cold weather, she had a return of the cough and other symptoms. At this time, she showed the effects of these repeated attacks. She was anemic, had lost fifteen pounds in four weeks, was weak, and greatly depressed mentally. She continually expressed a willingness and desire to die, and her mental condition became distressing

to her relatives. Another examination of the sputum for Bacillus tuberculosis was made. At this time I felt firmly convinced that my patient was suffering from pulmonary tuberculosis, but tubercle bacilli could not be demonstrated in the sputum after exhaustive examinations. I then examined smears of the nasal and bronchial secretions for Bacillus influenzæ and discovered an organism conforming in morphological and staining reactions to this organism. I then made glycerin-agar and ox-blood agar smear plates from the bronchial and nasal secretions, and found in mixed culture Bacillus influenzæ. The cough has persisted with more or less severity for the last year and a half, and patient has had at least ten attacks of influenza. Examinations of the sputum made on three occasions in the last four months, show a continuation of the bacillus.

CASE II.—S. F., a female, white, aged sixty-four years, has had two attacks, the second of the gastro-intestinal type. The organism was present in the nasal and bronchial discharges for three months after the last attack. She steadily lost weight, and since her last illness has had at irregular intervals attacks of pain in the right upper quadrant of the abdomen, resembling gallstone colic. There is no history of hepatic or gall-bladder infection prior to the "grippe" infection.

CASE III.—J. McB., male, white, aged fifty-eight years. In February, 1908, the patient was attended by me during a typical attack of influenza. No examination for the bacillus was made, but a localized epidemic prevailed in Washington at the time. The patient apparently made a prompt recovery from the acute symptoms, although tardy in regaining his strength and normal tone. In June of 1908, while attending the wife of the patient, he complained to me of loss in weight, apathy, and nervous instability; he said he "had chills at irregular intervals, followed by fever and drenching sweats." He suffered from dyspnœa on exertion, and had noticed for the past three months that his ankles became swollen toward evening. He appeared to have lost considerable weight, was anemic, and, in comparison to his robust appearance before his attack in February, was physically a derelict. Examination for Plasmodium malariæ was negative. Physical examination revealed marked increase in the area of cardiac dulness, with signs of mitral insufficiency and aortic stenosis.

He was put to bed and I called Dr. Thos. A. Claytor in consultation, who concurred in the findings as to heart, and in addition discovered the spleen markedly hypertrophied. The patient improved sufficiently to travel to Massachusetts, where he died several weeks after admission to a sanitarium.

The following cases excerpted from the literature are presented as bearing on influenza as a chronic infection.

F. C. Doble[1] reports a case of pericarditis and endocarditis

[1] Lancet, April, 1908.

appearing three days after very mild symptoms of influenza. The patient had a similar attack one year previous, and the physician (not Dr. Doble) told the patient he had "influenza of the heart." Doble says: "It is curious that the pericardium should be affected by so mild an attack of influenza, especially with slight bronchial symptoms. It seems to prove that Bacillus influenzæ circulates in the blood early in the disease in even a mild form and produces a true septicemia."

R. D. Brown[2] discusses at length the relative increase in psychoses during influenza. He says: "That cases of mental disease are increased by influenza cannot be disputed. It is well recognized that very frequently a certain amount of lassitude, neurasthenia, or mental depression is present long after an attack of influenza, though of mild character and short duration." A patient once with influenza during the fall or winter means a patient until spring or summer. It has been suggested that it is the postinfluenzal exhaustion that is the important factor, but although this may be true in some cases, it is not in all. The mental symptoms appear very often as soon as the second or third day of the disease. The influenza bacillus or its toxin seems to be the exciting agent rather than the fever of postfebrile exhaustion. A peculiar feature is the liability of postinfluenzal psychoses to relapse.

Clouston, in 1890, said: "The microbe or the poison of influenza destroyed the cortical energy to a much larger extent than any of the continued fevers or zymotics; nay, its effects on the mental condition of Europe, during the years of its prevalence, far exceeded in destructive powers all those diseases put together. . . . It left the mental and nervous tone of Europe lower by some degrees than it found it."

Bezly Thorne, in 1890, looked upon influenza as a cerebrospinal malady, and at that time this view was generally accepted. In nearly every case he had found some portion of the spine tender three or four hours after the onset of the attack. Gilbert Smith, at the same time, believed the morbific agent, howsoever originally produced, might be further developed in the human body and become the source of increased contagion. C. E. Abbot reports a case of "double attack," the first occurring January 18, 1890, and followed by rapid convalescence, the second on April 3, 1890.

Sansom has been one of the best investigators of influenza. He reports a case in a man, aged fifty-three years, with "recurrent attacks of hepatalgia without jaundice and protracted enfeeblement for twenty months after the acute attack contracted in Paris. He classifies his cases of prolonged pain as follows:

[2] Scottish Med. Jour., 1902.

	Cases.
I. Epigastrium	9
Abdomen generally	2
Hepatic area localized	1
II. Head—various sites	7
Supra-orbital	1
Right inferior maxilla	1
III. Cardiac region	7
IV. Extremities—hips and legs	2
Calves	2
Arms	2
Right sciatic region	1
Fingers	1
Lumbar region	1

In all of these cases the symptoms of pain and protracted enfeeblement were almost constant from six months to as many years after the acute attack, and some patients had recurrence of general symptoms of influenza at intervals.

F. T. Lord[3] reports 11 chronic cases of influenza; "1 recovered, 1 died of cerebral hemorrhage, and 1 of chronic bronchiectasis and emphysema; 8 continued to cough with persistence of influenza bacilli in the sputa. "It is of interest to note that 5 of these patients were treated in the fall of 1902 at institutions for the cure of tuberculosis" (Lord).

The following cases, reported by F. T. Lord, are of great interest. Of 11 chronic cases, 2 died; 1 showed Bacillus influenzæ for a period of four years, during which time she had chronic cough. The autopsy revealed diffuse bronchiectasis and emphysema. A second patient had an asthmatic cough for nineteen months before admission and the organism persisted in the sputum for one month. He died two years after the attack. No autopsy was made. "Of the 9 cases followed one to three years, 8 showed no material improvement since they first came under observation." Their cough improves somewhat each summer, to return with equal intensity in the winter.

Between August, 1902, and January, 1904, Lord examined the sputum from cases coming to the out-patient department of the Massachusetts General Hospital. Cases were unselected, except to exclude from investigation those patients in whom Bacillus tuberculosis was found. Clinically they suffered from acute or chronic disease of the respiratory tract. In 110 (59 per cent.) of the 186 cases an organism having the morphology and staining reaction of Bacillus influenzæ was seen in varying numbers. In 56 cases (30 per cent. of all investigated) the organism was shown by culture to conform in all respects to the bacillus described by Pfeiffer in 1892, and regarded by him as the cause of epidemic influenza. In 47 cases (25 per cent. of all studied) the influenza bacilli were in overwhelming numbers. As the technique improved

[3] Boston Med. and Surg. Jour., April, 1905.

the organism was found in somewhat larger proportions. The cases showing the bacilli in the sputum were quite evenly distributed over the eighteen months during which the investigations were pursued. No epidemic of acute influenza occurred during this period.

Chronic influenza as a contributing or as the sole cause of nervous disease is a subject which has been of interest to me. The merits of the assumption I shall be compelled to depend upon superior authority to prove or disprove. It is without question that organic and inorganic nerve disease results from acute influenza. Whether influenza is the original cause of psychoses acting as a chronic infection, or whether it is the contributing cause to a psychopathic basis, is a question which is beyond my knowledge of psychiatry. The history of influenzal epidemics has shown statistically that the mental and nerve force is lowered for a considerable time after the disappearance of the disease epidemically. A brief resume of a few of the symptoms and sequels, show a predominance of nervous involvement.

Prostration is frequent and far outlasts the symptoms of the disease. Vertigo, insomnia, delirium, and coma are not uncommon. Neuralgic pain is one of the most common disturbances, accompanying, persisting, and recurring irregularly, after the decline of fever and the subsidence of other symptoms. Myalgia, joint pains, hyperesthesia, anesthesia, neuritis may accompany and not infrequently follow attacks for lesser or greater periods. Neurasthenia, or more frequently cerebrasthenia, may be initiated, and the opinion is held that these neuroses are the result of chronic infections by influenza acting directly or through the medium of symptoms of localized inflammation. Epilepsy has immediately followed influenza. To conclude, I have submitted evidence which is far from adequate, but a theory that is strongly in favor of influenza as a chronic as well as an acute disease.

I am of the opinion that influenza is not only with us always as a chronic infection, but it is the source of acute cases occurring sporadically and endemically.

While I have not touched on the invasion of the accessory sinuses by the organism, in closing some consideration should be given this most frequent complication, or rather extension, of the local inflammation. Bacillus influenzæ is responsible for a very large majority of cases of sinusitis, otitis, salpingitis, mastoiditis, and their sequels. The organism has been recovered in the discharge of more than 50 per cent. of patients suffering from suppurative otitis media, usually mixed with the pyogenic organisms. Dench claims that most all cases of maxillary sinusitis are the result of influenzal infection, and emphasizes the fact that the organism finally produces a low grade of inflammation with the formation of polyps and hypertrophy.

REVIEWS.

A System of Medicine. By Many Writers. Edited by Sir Clifford Allbutt, K.C.B., Regius Professor of Physic in the University of Cambridge; and Humphry Davy Rolleston, M.D., Senior Physician to St. George's Hospital, London. Vol. VI; pp. 861. London: Macmillan & Co., 1909.

Volume VI of Allbutt and Rolleston's *System of Medicine* is devoted to diseases of the heart and bloodvessels—a convenient and appropriate arrangement. The volume opens with a brief though interesting chapter on the physics of the circulation, by James Mackenzie; this comprises a revision and amplification of Professor Sherrington's original introductory chapter on cardiac physics—added to, however, by some discussion of the peripheral circulation and blood pressure. Diseases of the pericardium are described very satisfactorily by Frederick T. Roberts, and the clinical descriptions are enhanced by several effective illustrations. Sir R. Douglas Powell discusses diseases of the myocardium and angina pectoris. It is, of course, difficult to separate diseases of the myocardium from other disorders of the heart, and the effort to do this is perhaps responsible for what seems to be a fragmentary and somewhat disconnected discussion. Amends, however, are made in the article on angina pectoris; although, here also one can scarcely escape the conviction that a little too much is made of angina pectoris vasomotoria. What is described as angina pectoris gravior is divided into secondary cardiac angina and primary cardiac angina—both well and ably discussed—albeit one may not be able always to make a differential diagnosis during life. Attention is directed to the fact that all too generally the outlook is deemed exceedingly grave, whereas, by resort to appropriate treatment, much may be done, not only to relieve symptoms, but to remedy the conditions which underlie them.

The volume owes much of its value to the two regius professors of physic who adorn the English profession. Professor Allbutt himself contributes articles on overstress of the heart, disease of the aortic area, and functional disorders. As is well known, he has devoted much time and patient thought to the study and investigation of the effect of mechanical strain on the heart and bloodvessels, and he has repeatedly given to the profession the results of his time and

efforts in language that well may excite the envy of others less well endowed. It were trite, therefore, to say that these articles must be read by all who would keep informed of what the master mind believes; but upon an occasion such as this one may venture to emphasize it. The discussion of fatigue, acute and chronic strain, and cognate subjects is as illuminating as it is convincing, and withal moderate in tone and cheerful in general outlook. The chapter on aortic valve diseases is replete with splendid clinical descriptions and wise counsels; his discussion of the relation of infections, mechanical strain, and the atheroma of senescence fulfils all the requirements of those who would become informed of the etiological factors; and his therapeutic recommendations reveal the close and experienced observer. He who has not yet become convinced of the value of morphine in many cases of advanced heart disease should read and ponder well what he says. Professor Osler, the other regius professor, in association with A. Keith, contributes a new article on Stokes-Adams disease, which comprises all known on the subject to date, as well as remarks on conditions of a related nature that necessarily enter into the differential diagnosis. He contributes also a new article on aneurysm—in his usual inimitable style.

There are some other notable contributions. G. A. Gibson has revised and enlarged the late A. E. Sansom's chapter on disease of the mitral valve, making it an even more valuable discussion than it was. Thomas McCrae has revised the late J. Dreschfeld's account of acute simple endocarditis. G. Newton Pitt describes diseases of the right side of the heart; I. Humphry, congenital diseases; and T. Oliver, injuries produced by electrical currents of high pressure. F. W. Mott has materially revised and somewhat amplified his chapter on arterial degenerations and diseases. M. H. Clutton describes phlebitis. The book closes with a revision by the junior editor, Dr. Rolleston, of Professor Welch's well-known articles on thrombosis and embolism, and a new article by himself on diseases of the lymphatic vessels.

All in all the volume is assuredly one of the most important of the series; and being devoted to the very absorbing and important subject of diseases of the heart and bloodvessels merits the attention of all practising physicians. A. K.

A Manual of Operative Surgery. By Sir Frederick Treves, Bart., G.C.V.O., C B., LL D., F.R.C.S., and Jonathan Hutchinson, F.R.C.S., Surgeon to the London Hospital. Third edition; in two volumes. Vol. II; pp. 821; 301 illustrations. Philadelphia and New York: Lea & Febiger, 1910.

The first volume of this edition of Treves' *Operative Surgery* was reviewed in the November, 1910, number of this journal (page

742). The present volume completes the work, and deals with the head, neck, and spine, the thorax and breast, the vessels and nerves, amputations, the bones, joints, and tendons, the muscles, ligaments, and fasciæ.

The articles on the skull and brain, and on the middle ear and the mastoid antrum, have been revised and largely rewritten by Mr. A. J. Walton. The general teachings as to head injuries and brain diseases are in the main sound. In the section on the operative treatment of intracranial hemorrhage some confusion results from a certain indefiniteness in writing of extradural and subdural hemorrhages. Sir J. Hutchinson is quoted as having said, in 1867, that the modern annals of surgery do not contain any cases in which life has been saved by trephining for "this state of things." As both the preceding and the following paragraphs deal with the two forms of hemorrhage, it requires careful reading to determine which "state of things" is meant. Moreover, the remark has now only historical interest; and this is true of Prescott Hewett's statistics (1883) as to the frequency of injury to the middle meningeal artery. Much later, more extensive, and equally reliable figures are easily obtainable.

In the discussion of the surgical treatment of epilepsy no mention is made of the interesting fact that most epileptics are temporarily benefited by *any* operation, even if it has no relation to the condition. This fact obviously affects all statistics—among them some quoted by the author—as to operative results, unless a considerable period of time has elapsed before the cases are reported. In the article on cleft palate, the author's views as to the undesirability of very early operation are rather suggested—by quotations from Sir Thomas Smith—than expressed, and might well be emphasized.

There are certainly some advantages in many cases of cervical tuberculous adenitis in early ligation of the internal jugular, and also in the application of carbolic acid to certain sinuses and curetted gland cavities that may unavoidably be left. We cannot agree that the former is a "gratuitous complication" or the latter a "risky procedure that can do no good."

In the section on cancer of the breast exception is very properly taken to the statistics of operators who arbitrarily fix a time limit of three years or so as establishing a "cure."

In the article on interscapulothoracic amputation no mention is made of the suggestion of Le Conte, made in 1897, and repeated at the International Congress in Paris in 1900, that instead of the routine resection of the middle third of the clavicle, the inner end of that bone be disarticulated and the bone elevated, or—if it is necessary—removed prior to the ligation of the vessels. This has been adopted (without credit to Le Conte) by Berger.

Matas' aneurysmorrhaphy is described by quoting a paragraph

from the original article (1903) and dismissed with a brief comment, to the effect that the authors cannot see "that anything is gained by the procedure." No statistics are given. The many reported successes are not alluded to. In the section on amputation of the leg no mention whatever is made of the method of Matas, now widely used in this country, while the practically obsolete "Teale" method occupies a page and a half.

The same tendency to disproportionate reference to British surgery—as compared with that of other nations—is noticeable in this as in the previous volume. Numerically it is again as hundreds to dozens. This is a grave defect that should not be perpetuated in subsequent editions. Nevertheless, the work as a whole is of distinct usefulness to the operating surgeon, though a catholic revision would have made it far more so. The new colored plates are excellent, and the illustrations are uniformly clear and instructive. The book is beautifully made.

J. W. W.

HOOKWORM DISEASE: ITS ETIOLOGY, PATHOLOGY, DIAGNOSIS, PROGNOSIS, PROPHYLAXIS, AND TREATMENT. By GEORGE DOCK, A.M., M.D., Professor of the Theory and Practice of Medicine in Tulane University, New Orleans; and CHARLES C. BASS, M.D., Instructor in Clinical Microscopy and Clinical Medicine in Tulane University, New Orleans. Pp. 250; 49 illustrations. St. Louis: C. V. Mosby, 1910.

UNLIKE many monographs which, on account of the rapidly progressing knowledge upon the subject, are valuable today, inasmuch as they reflect a passing view, but are out of date tomorrow, by reason of added information, this book of 250 pages gives a complete and nearly finished presentation of the important disease caused by Ankylostoma duodenale. The facts concerning all aspects of the disease processes, etiology, and treatment are for the most part well known, and except for certain details, perhaps it is possible to present the subject in complete and comparatively lasting form. This the authors have done in an admirable manner. It is scarcely necessary to mention the importance of this disease, not alone from the medical standpoint, but on account of the great economic and industrial problem which it entails. It is, therefore, highly desirable that, aside from the numerous articles, a readily accessible book containing all the necessary information upon the subject should be available. This book is therefore of great value. It is written so clearly that it affords a source of information for anyone who has the least interest in the matter, and is so fully illustrated that it affords an excellent guide to the practical study of the question. Though most of the cuts are excellently chosen,

it is to be hoped that in another edition a good original drawing of ovarian stages of the development of the egg and embryo of the hookworm will be substituted for the poor cut taken from Perroncito. We cannot help feeling, too, that the book would have been more valuable if many of the important references, at least, had been given. This, however, does not really impair its usefulness as a book presenting complete information concerning Hookworm Disease. W. T. L.

A Practical Study of Malaria. By William H. Deaderick, M.D. Pp. 402; 102 illustrations. Philadelphia and London: W. B. Saunders Company, 1909.

The author's excuse for adding another contribution on malaria to the already long list is a desire to furnish a "practical" work upon the subject, especially adapted to the needs of those who, like himself, are actively engaged in practice in malarial districts. This praiseworthy purpose has fortunately not led him into the error of sacrificing the scientific aspects of his subject; consequently he has produced a reasonably complete and, at the same time, eminently useful book. Although the contributions of other writers must of necessity play a prominent part in the make up of such a book as this, the author's own large experience has enabled him to add many valuable personal observations. The fact that he frequently quotes at length the great authorities upon malaria rather adds to the value of the book than otherwise.

Almost half the book is devoted to a consideration of the etiology of malaria and hemoglobinuric fever. The description of malaria-bearing mosquitoes and their habits is particularly full, perhaps unnecessarily so. The lengthy classification of the mosquitoes of North and Middle America could surely be omitted without seriously detracting from the usefulness of the work. Deaderick's description of the plasmodia of malaria embraces not only the now well-recognized schizogonic and sporagonic cycles of the life history of the parasite, but also includes a description of the rarely mentioned parthenogenetic cycle of Schaudinn. In this connection it may be mentioned that Deaderick is not prepared to accept the evidence recently advanced by Craig, that the parthenogametes result from the intracorpuscular conjugation of young asexual forms of the parasite.

In contradistinction to the attention devoted to the other divisions of the subject, the pathological anatomy of malaria is briefly dealt with. The symptomatology and clinical history of malaria, however, are considered in more detail. Deaderick agrees with most modern writers in classifying malaria clinically according to the form of parasite producing the infection. He rightly believes that

it is both confusing and inaccurate to attempt to associate the intermittent type of fever only with tertian and quartan infections, and estivo-autumnal parasites with remittent fever alone. He solves the perplexing problem of a satisfactory division of pernicious malaria by arranging all forms into three groups—the cerebrospinal, the thoracic, and the abdominal. However arbitrary this may be, it at least does away with the usual cumbersome multiplying of names.

The section on diagnosis includes a satisfactory description of the technique of making blood examinations for the malarial parasite. The question of differential diagnosis, although concisely stated, is, upon the whole, entered into sufficiently. The chapters on prophylaxis and treatment are adequate and set forth clearly the essential features of these two important divisions of the subject. It is of interest to note that Deaderick regards methylene blue as the best substitute for the cinchona preparations in the treatment of malaria. At the same time he emphasizes the great inferiority of this preparation to the latter drugs.

Throughout the book that interesting and but little understood condition, hemoglobinuric fever, receives much careful consideration. Deaderick maintains that malaria is "essentially and solely the predisposing cause" of hemoglobinuric fever, and places little credence on the theory that it is a distinctly separate condition due to protozoa other than the plasmodium of Laveran. The most original and ingenious feature in the entire book is the author's theory of the pathogenesis of black water fever. His hypothesis apparently affords a reasonable explanation for the peculiarities in the occurrence of this remarkable affection.

A word should be said concerning the numerous illustrations, most of which are good. A few of the photographs, however, seem to have more artistic merit than scientific value. Although typographical errors are surprisingly few, it is to be hoped that at the next printing the glaring grammatical slip on the first line of the preface will be corrected.

Taken as a whole, the book fulfils the purpose for which it was written and may be unhesitatingly recommended to all who desire to obtain an accurate conception of the malarial fevers.

G. M. P.

A Synopsis of Surgery. By Ernest W. Hey Groves, M.S., M.D., B.Sc. (Lond.), F.R.C.S. (Eng.)., Assistant Surgeon to the Bristol General Hospital, England. Second edition; pp. 579; 12 illustrations. New York: Wm. Wood & Co., 1910.

This volume is an epitome of the salient facts in surgical practice arranged in an orderly and impressive way and far superior to

the general run of such compilations. By means of heavy type and indented margins the reader's attention is rapidly called to the headings and subheadings of the different subjects and ready reference is facilitated. It is impossible to criticise the contents of such a book, and it suffices to state that it closely follows Rose and Carless' Text-book with frequent abstracts from other well-known monographs. It is an excellent book for rapid reference for those who have studied a larger text-book, but is a pitfall without the latter. The volume is small, easy to handle, and well printed.

G. P. M.

AN INTERNATIONAL SYSTEM OF OPHTHALMIC PRACTICE. Edited by WALTER L. PYLE, A.M., M.D., Philadelphia, Member of the American Ophthalmological Society. THERAPEUTICS, by DR. A. DARIER, Paris, translated by SYDNEY STEPHENSON, M.B., F.R.C.S., London, Late Honorary Secretary of the Ophthalmological Society. Pp. 444; 6 illustrations. Philadelphia: P. Blakiston's Son & Co., 1910.

IN the first part of this work upon general therapeutics, following a short chapter upon modern methods of diagnosis, the various means and remedies are reviewed and the indications for their use clearly stated. In the second part, upon special therapeutics, the treatment of the diseases of the different structures entering into the organ of vision, including glaucoma and sympathetic ophthalmia, are discussed *seriatim*. The author's well-known optimism is everywhere in evidence, but this, if not carried too far, is an attribute to be expected and even welcomed in a work dealing with therapeutics. It is, however, considerably toned down and to the advantage of the book in this edition as compared with the lectures as first published. The author still holds to the value of the organic salts of silver, protargol and argyrol, as compared with the nitrate. He thinks that the poor success obtained by some with the former is due to too infrequent application and insufficient strength. He tells us that argyrol, even in 50 per cent. solution, is absolutely painless; "argyrol causes less pain than cocaine or even distilled water."

In extraction of a cataract a preliminary iridectomy is regarded with favor generally, and considered to be definitely indicated in many conditions, such as indocility, or for fear of infective accidents in general maladies (diabetes, albuminuria, etc.). The author recommends allowing the patient to go to his home after extraction with iridectomy, returning when necessary to have the dressings changed. He tells us that this has been his practice in about one-half of the cases operated upon by him for more than twenty years, with results as favorable as when the patients are confined

to the house. Simple extraction, however, should be reserved for hospital treatment.

The translator, Mr. Sydney Stephenson, has, as was to be expected, succeeded admirably in giving the work its English dress. It reads as if it had been written in that language; it is without the ambiguities and strange forms of expression so frequently found in translations.

The editor is to be congratulated upon placing before the profession such an excellent work upon the important subject of ocular therapeutics. T. B. S.

Surgical Anesthesia. By H. Bellamy Gardner, M.R.C.S., L.R.C.P., London, Anesthetist at St. Mark's Hospital, etc. Pp. 240; 35 illustrations and 12 plates. New York: Wm. Wood & Co., 1909.

The author states that he has written this book in order to set out clearly for the student and practitioner of medicine principles upon which the art of inducing general anesthesia is founded and the best methods by which the art may be developed. The volume, as a whole, is well written, interesting, and instructive, and, being of small size, presents the subject in a compact manner, and, being free from multitudinous description of apparatus, is rather interesting to read. Unfortunately, the book is marred by constant reference to the testing of the corneal lid reflex in order to ascertain the depth of anesthesia, a procedure which has nothing to commend it and may result in severe injury to the eye. An excellent chapter entitled pathological conditions of the patient discusses those disorders and diseases which affect the exhibition of anesthetics. In discussing the various methods of anesthesia the author confines his remarks to nitrous oxide, ether, chloroform, and ethyl chloride. There is no mention of rectal anesthesia. The discussion of surgical shock is inadequate; the use of nitrous oxide and oxygen as an anesthetic, except for the pulling of teeth, is given no attention, although it is mentioned that there is no physiological time limit to its safe inhalation. The chapter upon anesthesia in operations upon special regions is very inadequate, no mention being made of operations upon the head in which special knowledge is required; nor of various expedients for giving anesthesia when operating upon the tongue, jaws, etc. The book making is satisfactory, although on pages 94 and 95 the figures are very crude.

G. P. M.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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Dioxydiamido-arsenobenzol.—EHRLICH (*Deut. med. Woch.*, 1910, xxxvi, 1893), in his address before the Versammlung deutsche Naturforscher und Aerzte, September, 1910, gives his observations and conclusions of the treatment of syphilis by arsenobenzol, based on his own work and reports sent him by clinicians of about 10,000 cases treated. The address contains so much that is important that it is impossible to condense it into a few paragraphs; only his conclusions may be referred to. It has been fairly well established that persistence of the spirochetes longer than twenty-four to forty-eight hours after the treatment means that the dose of arsenobenzol employed was too small. Further evidence of the specific action of "606" is seen in the production of antibodies in syphilitics who have received the drug. Their presence is indicated by (1) the curative action of the milk of syphilitic mothers (after treatment) on their infected offspring, and by (2) a similar result obtained by injecting the serum of such patients into luetic sucklings. Injection of "606" into sucklings should not be made until the benefit of the "milk antitoxic" treatment has been secured. A third specific effect is the disappearance of a positive Wassermann reaction after treatment. In certain instances the reverse occurs; a negative Wassermann becomes positive, due to the ultimate effect of the endotoxins liberated when the spirochetes are killed. If a positive Wassermann reaction is unchanged after treatment, the patient should be looked upon as uncured. A negative reaction may mean a cure, or it may mean that the spirochetes which remain are insufficient to yield a positive reaction; their multiplication in time leads to a positive test, indicating a relapse. Again, the almost instantaneous relief from pain, strikingly exhibited in patients with gummas of the tongue or throat, cannot be

explained on anatomical grounds, as it occurs too soon after injection. It must be due to a specific effect of "606." Aggravation of lesions, such as skin eruptions, following injections of "606," Ehrlich looks upon as a manifestation of the Herxheimer phenomenon. It has been observed only after minimal doses of the drug, and is probably explained by the fact that the spirochetes are not killed but are irritated, and thus produce more toxins. Ehrlich warns against the use of "606" in advanced disease of the central nervous system, especially in those presenting cerebral or bulbar symptoms, and also in patients with marked cardiovascular disease. In the former a Herxheimer phenomenon in a positive lesion might prove fatal; in the latter the changes which have already taken place in the heart or vessels cannot be removed. As to the method of administration, Ehrlich finds that intravenous injection leads to the quickest results; robust patients may receive 0.4 to 0.5 gram. The alkaline solution of Alt and Iversen is best for intramuscular injection, but it is rather painful. In neurasthenics, alcoholics, and others who are especially sensitive to pain, or in whom pain leads to cardiac disturbance, the less painful neutral emulsion of Michaelis and Wechselmann is to be preferred. In otherwise healthy individuals, Ehrlich believes the double injection method of Iversen will prove to be the best; 0.4 to 0.5 gram is given intravenously, and then, after two to four days, a subcutaneous or intramuscular injection (the neutral emulsion or the paraffin emulsion of Volk and Kromeyer). The size of the dose should be determined largely by the quality of the patient. He agrees with Alt that in disease of the nervous system the dose should be small—not over 0.4 gram. In the usual syphilitic, especially in the primary stage, larger doses—0.7 to 0.8 gram, possibly more—should be employed (not over 0.5 gram of this intravenously). Ehrlich urges all who employ arsenobenzol to control their results with Wassermann reactions made from time to time, for it is only in this way that the ultimate results of this therapy may be determined. Besides syphilis, "606" has been found to be of great therapeutic value in framboesia, relapsing fever, sleeping sickness, and malaria. It appears possible that it may be useful in the treatment of smallpox, though at present the experimental stage has scarcely been entered with this disease.

The Intravenous Administration of "606" and its Application Locally.—SCHREIBER (*Deut. med. Woch.*, 1910, xxxvi, 1898) describes a method of preparing arsenobenzol for intravenous injection which he has found satisfactory in over 400 cases. The dose employed should be smaller than that given subcutaneously or intramuscularly; he has found 0.3 gram for women, 0.4 to 0.5 gram for men, to be safe. The drug is placed in sterile water and then *normal* sodium hydrate solution is added. For 0.4 gram of arsenobenzol about 2.8 to 3 c.c. of sodium hydrate is required. If, after vigorous shaking, the solution is not clear, more hydrate is carefully added, a drop at a time, until all the "606" is dissolved. The solution is then diluted to 200 c.c. (150 c.c. or 250 c.c. proved equally suitable) with sterile water or sterile physiological salt solution. (It is understood, as a matter of course, that all the apparatus is sterile.) Before injecting, the solution should be warmed. Care must be exercised that none of the drug is injected into the perivascular tissues, as it is very painful. To determine whether the needle is

within the vein, Schreiber, who employs a needle with a three-way stopcock, first injects a small quantity of salt solution. After the injection of the drug is completed the tubing and needle are washed out with a few cubic centimeters of salt solution. No pain results from the injection except that produced by the needle, which is negligible. In a little more than 400 patients treated in this way no bad effects have been noted, but vomiting and diarrhœa may ensue if the dose exceeds 0.5 gram. At times there is temporary elevation of temperature, rarely above 40° C. The temperature seldom remains above normal longer than a day. In disease of the central nervous system, especially tabes, the rise in temperature is usually delayed, occurring on the second or third day after injection. Occasionally nausea, vomiting, diarrhœa, and headache were observed, and in one instance urticaria. No ocular or renal manifestations were discovered. In cases in which a second intravenous injection has been resorted to the febrile reaction was less marked or entirely lacking. In treating chancres and condylomas, the author has had very good results from dusting powdered arsenobenzol locally or applying it in the form of a 50 per cent. salve.

Necrosis of the Gluteal Muscles after the Injection of Arsenobenzol.—Wechselmann (*Deut. med. Woch.*, 1910, xxxvi, 1910) mentions, among other things, the possibility of necrosis of the muscles after injection into them of "606." He believes that patients exhibit considerable individual variation in susceptibility to muscle necrosis. Orth (*Ibid.*, p. 1903) reports two cases studied histologically in which such necrosis of the gluteal muscles was found. No local infection was demonstrable by cultural methods, nor was there infiltration with pus cells. One of the patients died six weeks after the injection of "606" from laryngeal carcinoma. Necrosis was still to be seen.

The Treatment of Relapsing Fever with "606."—Iversen (*Deut. med. Woch.*, 1910, xxxvi, 1899) has used the Ehrlich-Hata compound in 60 cases of relapsing fever with remarkable results. On experimenting, he found 0.3 gram the proper dose in this disease. Hourly examinations of the blood after the injection demonstrated the complete disappearance of the spirochetes in five to ten hours. With the loss of the organism from the blood, the symptoms disappear and the patient remains well. Thus it is possible with a single dose of the new remedy, arsenobenzol, immediately to arrest the progress of the disease. This result is the more noteworthy since the disease has proved resistant to all previous forms of medication. The author has also had some experience in the treatment of malaria with "606." The patients were studied in the Caucasus. Of 60 cases of tertian malaria treated (0.45 to 0.8 gram intravenously and subcutaneously), 70 per cent. showed no more parasites in the blood after twelve to twenty-four hours. In the remaining cases the parasites persisted in the blood for several days. Only 4 cases of quartan fever were treated; in 2 of these two mild paroxysms followed the injection and then the parasites disappeared; the other 2 cases did not react to the drug. The results in estivo-autumnal malaria were again rather disappointing.

Complement Fixation Tests in Thrombo-angiitis Obliterans.—The pathological study of this condition was published in this journal in October, 1908. It showed that most of the arteries, and sometimes the veins as well, are obliterated over a large extent of their course in the lower extremities. All stages of the occlusive change occur in the various vessels of an extremity or in the same vessel in different parts of its course. The closure is effected by red obturating thrombi; these become organized, vascularized, and canalized. These lesions are not secondary to the gangrene; they may occur without the latter. In short, the condition is initiated by the formation of occlusive thrombi, chiefly in the arteries, but not confined to these, followed by organization or healing, with an attempt at the production of a collateral circulation. This results clinically in pains, ischemia, cyanosis, and trophic disturbances in the affected limb, even extensive gangrene. BUERGER and KALISKI (*Medical Record*, 1910, lxxviii, 665), realizing that this periarteritis might suggest syphilis, have investigated a series of cases with this in view. The authors and Oppenheimer failed to demonstrate Spirochæta pallida in any of the vessels removed from amputated limbs. Nothing definite was ascertained in the histological study to throw light upon the etiology of the process. Clinically, a history of lues in these cases is rarely elicited. Only 2 out of 80 had had a definite syphilitic infection. Twenty-nine cases were examined serologically by complement fixation tests for syphilis. In every one of the 29 the reaction was definitely negative. In only 1 of these could mercurial treatment be considered as influencing the reaction. Buerger and Kaliski conclude that it is fair to assume the disease is probably not of luetic origin.

The Auscultatory Method of Determining Blood Pressure.—In 1905 Kurotkon described the auscultatory method of measuring blood pressure. With the ordinary cuff and manometer, if a stethoscope be placed over the artery below the cuff, avoiding pressure, and the air gradually released, a remarkable cycle will present itself. GOODMAN and HOWELL (*Univ. Penn. Med. Bull.*, 1910, xxiii, 469) have measured the five different phases of this cycle in figures of pressure on the manometer. With a normal pressure, systolic 130 mm. and diastolic 85 mm., the phases are clear-cut and bear a definite relation to the differences between the extremes of pressure. First, is heard a loud, clear-cut, snapping tone (first phase), due to sudden distention of the vessel walls by the inrush of blood. This persists from the point of systolic pressure for 14 mm. Then follows a series of murmurs, during a drop of 20 mm., the second phase, due to whirlpool eddies produced at the point of constriction of the lumen by the cuff. Suddenly they disappear and a tone which resembles the first is heard. This is the third phase, due to a now well-established stream in the vessel. It lasts for 5 mm., and is followed by a dulling of the sound, for 6 mm., a transitional fourth phase. The fifth phase marks the diastolic pressure. At this point all sounds disappear. Goodman and Howell believe this method to be preferred for simplicity and accuracy. Absence of the fifth phase is pathognomonic of aortic insufficiency. They believe variation in sequence relation of the phase, the recognition of tonal arrhythmias, and irregularities in maximal and minimal pressures will prove of much value in the diagnosis of cardiac neuroses.

Dysentery Carriers.—MACALISTER (*Brit. Med. Jour.*, 1910, ii, 1506) divides carriers into two great classes. The first class consists of healthy persons, who have never suffered from the disease and show no signs of ill health, but nevertheless harbor and scatter the specific organism. In the instance of bacillary dysentery this class is small and unimportant. The author has never found a single case, but Conradi, Collins, and Mayer have been able to demonstrate such conditions in both children and adults living among those affected with the disease. In the second class are people who have had the disease and are thereafter unable completely to eliminate the infection. As agents in the spread of the disease this group cannot well be overestimated in importance. They consist of two groups, in the first of which convalescence is discovered only by the continuation of agglutination. They do not relapse, but they harbor infection somewhere, and an occasional stool contains mucus. The second group is of relapsing and chronic cases, a constant source of infection. Macalister emphasizes the need of isolation, observation, and care during convalescence as a means of prevention of spread of an epidemic. Unfortunately, these incomplete convalescents form a high proportion of the cases.

The Parathyroid Glands and Sudden Death.—As a cause of sudden death in children, not a few cases of status lymphaticus have been recorded. But it often happens that necropsy reveals no adequate cause of death. GROSSER and BETKE (*Münch. med. Woch.*, 1910, lvii, 2077) report 3cases which would fall in the latter category, had they not carefully dissected and examined the parathyroid glandules histologically. In all their cases no lesion sufficient to cause death was found, aside from the changes in the parathyroids. In 2 cases they found only three glandules —all hemorrhagic. In the remaining case all four glands presented fresh, extensive hemorrhages. Similar lesions were not discovered in other organs. From a study of the literature, they find that more than one parathyroid gland must remain intact to preserve life. They believe, therefore, that the lesions they found in these glands are quite sufficient to explain the death of the patients, and urge the necessity of their careful examination in cases which are obscure. The patients died with spasms.

Anemia and Hemolytic Icterus of Tuberculous Origin.—LANDOUZY (*Presse médicale*, 1910, 761) reports the case of a young man, aged thirty-eight years, with pulmonary tuberculosis. The man had a severe grade of anemia—red blood corpuscles, 1,050,000, and hemoglobin, 10 per cent. The spleen was enlarged. The conjunctivæ were subicteric, and the urine highly colored (urobilin). A diminution in the resistance of the red blood corpuscles was demonstrated (0.54 per cent.). As many as 25 per cent. of the red cells showed granules on vital staining, and the nucleated red cells amounted to 35 per cent. The patient's serum contained neither isolysins nor autolysins. After a time, under treatment, the signs of infection regressed, with a similar change in the anemia and icterus. As the pulmonary lesions seemed to become stationary, the fragility of the red blood cells disappeared. This parallelism of the hemolytic syndrome and the infection and the absence of any other cause leads Landouzy to believe the hemolytic jaundice dependent

upon the tuberculosis. It is known that acquired hemolytic jaundice is met with under various circumstances. Malaria, syphilis, and cancer are among the known conditions in which this syndrome has been met with. The author believes his own observation to be the first in which the hemolytic condition evolved in the course of tuberculosis. It supports the hypothesis of the bacillary origin of certain of the hemolytic syndromes.

Typhoid Fever Statistics.—SALLOM (*Med. Record*, 1910, lxxviii, 625) states that from January, 1898, until June, 1909, there occurred in Philadelphia 68,943 cases of typhoid fever. Of this number, 8102 died, a mortality of 11.75 per cent. It is well known that season affects the prevalence of typhoid fever. These statistics show, without doubt, an influence upon mortality also. Starting with a mortality of 10 per cent., it rises during February and March up to 12.37 per cent. Falling during April, it ascends again in May and June. The July mortality is phenomenal, reaching the maximum of 17.61 per cent. Dropping as precipitately as it rose, the mortality of August and the rest of the year varies between 10.21 and 11.75 per cent. On the other hand, morbidity is highest in January and February and lowest in the fatal month of July. Likewise, in September, when the second maximum of morbidity occurs, a second minimum in mortality is obtained. The point is made, however, that a patient dying in January, for instance, probably contracted the disease in December, in the majority of cases. Therefore, Sallom constructed a second chart, in which the mortality for any month was considered with the morbidity of the preceding month. This collaborates the first figures. With the minimum morbidity of July the first maximum in mortality is present; and with the second maximum in morbidity, occurring during September, the minimum mortality is obtained. Sallom concludes that with the maximum morbidity a minimum percentage mortality is present, and *vice versa;* and, further, as morbidity falls mortality rises.

SURGERY.

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The Operative Treatment of Penetrating Wounds of the Diaphragm.—MAGULA (*Archiv f. klin. Chir.*, 1910, xciii, 581) collected from the literature 129 cases of penetrating wounds of the diaphragm which had

been operated on, and adds 61 new cases. There were 64, but 3 did not come to operation. In the great majority of the cases the wound comes by way of the pleural cavity. In a very large number wounds of the breast and of the abdominal organs are associated, in Magula's cases in 59 per cent. It is incontestible and recognized nearly everywhere as axiomatic, that expectant treatment in these cases is not to be recommended, for the following reasons: (*a*) There is always the danger threatening the occurrence of and the strangulation of a diaphragmatic hernia. (*b*) There exists also the danger that the wound of an organ, the breast or an abdominal organ, will be overlooked and the patient die of internal hemorrhage or peritonitis. Since, on the other hand, the diagnosis of a wound of the diaphragm before operation is especially difficult, and, according to Magula's experience, in about 40 per cent. of the cases impossible, because of the absence of the characteristic signs, the view is gaining ground that every penetrating wound of the thorax or abdomen, not more than twelve hours old, should be enlarged and explored. Magula's experience strongly supports this view. The operation of choice for all cases is by the pleural route. Only in rare cases must the combined method, thoracolaparotomy, be employed. If the closure of the wound of the diaphragm is impossible, the pleural cavity should be isolated, that is, the edges of the diaphragmatic wound should be sutured to the costal pleura. In this way a diaphragmatic hernia is prevented and the avenue for infection of the delicate pleura is shut off.

Arthritis Deformans in Children.—PERTHES (*Deut. Ztschr. f. Chir.*, 1910, cvii, 111) says that the examination in one case showed that while flexion was free, abduction, adduction, and rotation were completely abolished. The trochanter was 1 cm. above the Roser-Nélaton line. There was no pain on movement or pressure and the *x*-rays showed it was not a case of coxa vara. The angle of the femoral neck was normal and the head cone-shaped rather than globular. Observation during a year gave further indications of the existence of an arthritis deformans. Within a year Perthes saw not less than 6 similar cases. Von Brunn, in 1903, collected 38 cases from the literature, 26 occurring on one side and 12 being bilateral. The frequency and practical importance of this condition in children is greater than has been thought up to the present time. In the greater number of cases trauma does not occur. There is no reason to ascribe the cause to asymmetry of the body. In one of Perthes' cases the condition originated in a bacterial inflammation of the hip-joint, although the first sign appeared only after a symptomless interval of several years. The first pathological change is often a flattening of the epiphysis of the head, which frequently results in a cone-shaped deformity of the head. The gradual change in its shape can be shown by a series of skiagrams, which also indicate disturbances in nourishment within the epiphysis and the development of subchondral foci of absorption. The limitation of movements is the direct mechanical result of the formation of the joint. Pain is not produced by active or passive movement. Spontaneous pain, on the other hand, occurs especially after long-continued walking, and not rarely is referred to the knee. Yet there occur cases in which, notwithstanding a high grade of deformity, pain of all kinds is completely absent. Crepi-

tation can be demonstrated only in a small portion of the cases. Lameness, which is, as a rule, the first symptom of the condition, is due, as in congenital luxations and coxa vara, to insufficient abduction. Confusion in diagnosis between arthritis deformans, coxa vara, and tuberculous oxitis is to be expected. In those cases which have been watched for a long time the pathological changes progressively advance. At times, however, the limitation of movement and spontaneous pain may be improved. In the treatment immobilizing bandages are to be avoided. Systematic passive movements and massage are to be recommended. For the cases with far-advanced bone changes, operative treatment should be considered. This may consist of operative modelling of the head or of resection.

Tenomyoplasty in Inguinal Eventration.—Jacobovici (*Deut. Ztschr. f. Chir.*, 1910, cvii, 289) did the following operation on a left-sided inguinal eventration in which the hernial aperture admitted four fingers. An incision was made, beginning at the outer side of the thigh, about 15 cm. below the anterior superior iliac spine and extending upward to just below the spine. From this point it was carried across the abdomen about to the linea alba. The flap thus outlined was turned downward and inward, exposing widely the field of operation. An incision was then made in the sheath of the rectus, parallel to the median line, from the pubis to the upper part of the wound, and continued at right angles from the upper end of this incision outward almost to the outer edge of the rectus muscle. This flap of the rectus sheath could be turned downward. The inguinal canal was then opened by a slightly curved incision extending from the anterior superior spine to the external ring. In this way a second flap was obtained from the external oblique aponeurosis, with its base at Poupart's ligament. There was no hernial sac present, but if there were it could be handled as in the ordinary Bassini operation. The edge of the flap from the rectus sheath was then turned downward and sutured over the hernial region to the edge of Poupart's ligament. Over this the flap from the external oblique was sutured, thus covering the hernial region with two aponeuroses. The sheath of the sartorius was then opened by a longitudinal incision and the muscle divided transversely at the junction of its upper and middle thirds. After suturing the end of the distal portion to its sheath, the proximal upper third of the muscle was freed from its bed and laid over the hernial region, where it was fixed with sutures, the cut end lying over the exposed surface of the rectus muscle. The sheath of the sartorius was then closed by a continuous suture, and the skin wound closed. A strong abdominal wall was thus obtained and there were no disturbances in walking from the division of the sartorius.

The Functional Cure of Paralysis of the Trapezius by Means of Detached Portions of Fascia.—Rothschild (*Zntrlbl. f. Chir.*, 1910, xxxvii, 1441) says that while the serratus magnus, by turning the scapula on its long axis, continues the abduction of the arm after the horizontal has been reached, upon the trapezius falls the task of holding the bone in its normal position. This permits the serratus to come strongly into action. If, in a case of paralysis of the trapezius, while an attempt at voluntary abduction of the arm is being made, the scapula is pressed

toward the spine and toward the feet, thus placing it in its normal position, the disturbances in the movement of the arm disappear immediately. This manual pressure can be substituted by operation, through a pull in the opposite direction. A free exposure of the field of operation is obtained by an incision from the superior vertebral angle of the scapula, downward to the first lumbar vertebra. A piece of the fascia lata is taken, about 20 cm. long and 4 to 5 cm. wide. One side of the narrow end is fixed by sutures to the vertebral border of the scapula, and while an assistant presses the scapula toward the spine, and downward, the other side is sutured under strong tension to the latissimus dorsi and deep muscles close to the spine. In order to prevent the adhesion of the fascial strip to the overlying skin, it is placed under the trapezius muscle. In a case so treated, in which the paralysis had existed half a year, and had rendered the patient completely unable to work, in ten days he was so improved functionally that neither he nor his physician could see any difference between the affected and normal sides. Cosmetically, the improvement was marked.

Contraindications to the Intravenous Infusion of Saline Solutions.—BERTELSMAN (*Zntrlbl. f. Chir.*, 1910, xxxvii, 1417) says that König has twice seen death hastened by large intravenous infusions of saline solutions. He had previously strongly recommended them, and the present paper was written chiefly to meet the objections of Heineke and others to them. Heineke says that they are strongly contraindicated in peritonitis cases in which occur disturbances of circulation from paralysis of the vasomotor centres. In these cases the heart is deprived of blood because the greater part of the latter is retained in the relaxed abdominal vessels. Bertelsman believes that by filling up the whole system of bloodvessels a quantity can be introduced which will compensate for the relaxation of the abdominal vessels. The heart will thus be filled and after some time the circulation will return approximately to the normal. In this way favorable operative conditions will be produced. That this hope is justified he has proved many times. It has been shown that in peritonitis we do not have to deal with the bacterial contents of the blood, since surgical peritonitis, as a rule, is not a general infection. It is well known that saline solution impairs the bacterial properties of the blood, and that therefore it should not be employed in general infections. When there already exists weakness of the heart, one should proceed with more care. In severe pneumonias, since the bacteria are circulating in the blood, the disturbances of the circulation can best be combated by small quantities of saline solution with adrenalin added.

Operation for Exstrophy of the Bladder.—FINK (*Zntrlbl. f. Chir.*, 1910, xxxvii, 1467) refers to the ingenious operation of Makkas, in which a new bladder was made of the isolated cecum, the ureters implanted into it, and the appendix used for a urethra (for abstract, see this journal, 1910, cxl, 761). Fink did an operation in which, after closing the ectopic bladder, he used the appendix to conduct the urine from the bladder to the cecum. It consisted of the following steps: An incision was made along the junction of the bladder and the skin and including the remains of the urethra. The bladder wall was then separated down to the ureters, which were catheterized. The peritoneum was

opened in the upper part of the circumference of the bladder and the appendix was located and brought into view. It was 6 cm. long and was divided transversely near its peripheral end. The canal was then irrigated with water toward the cecum to cleanse it and establish the permeability and caliber of its canal. The bladder opening was closed by suture of the muscularis and mucosa to the upper pole. A perforation was made into the bladder at its deepest part and the end of the appendix introduced through it and sutured in place. The mesentery of the appendix was sutured to the bladder to fix it more securely. The remaining opening was then closed. The patient died, so that the functional results could not be shown. The following advantages are advanced for the operation: The bladder is formed of tissue anatomically and physiologically normal. The normal valves of the appendix prevent the entrance of gas and feces, as after the Maydl operation, when the ureters are transplanted into the sigmoid. If infection should occur, the appendix could be conducted to the surface by a second operation.

Figures about Fractures and Re-fractures of the Patella.—CORNER (*Annals of Surgery*, 1910, lii, 707) collected the statistics of cases of fractures of the patella admitted to St. Thomas' Hospital during the years 1890 to 1907, inclusive. There were in all 504 cases, and of these, in 55 re-fracture occurred. The most important points which they show are summarized as follows: Fractures in the lower half of the patella are the most frequent (83 per cent.). Triangular-shaped patellæ are the most common; oblique-shaped patellæ come next. Transverse fractures are the most frequent; comminuted fractures come next. Three males fracture their patellæ to one female. Fractures of the right patella are a little more frequent than of the left. Two underwent operation to every one that did not. Fracture of the patella is most frequent between the ages of thirty to forty years. It is the most frequently re-fractured bone in the body. After operation, 69 per cent. of re-fractures occur in the first year after the injury. After treatment other than operation, 86 per cent. of re-fractures occur after the first year. The percentage frequency of re-fractures is approximately the same after operative as it is after non-operative treatment. The advantages of operation are solely in the quick and complete recovery of the function of the limb.

Surgery of the Thorax.—QUINBY (*Surgery, Gynecology, and Obstetrics*, 1910, xi, 482) says that by the intratracheal insufflation method of operation of Meltzer and Auer we can now create a situation corresponding to that of internal respiration, in which the dangers of pneumothorax are entirely overcome. It is the simplest method known which will "breathe for the patient." Other methods have allowed carbon dioxide slowly to accumulate in the air passages, and finally endanger the heart. By this new method it is very hard or even impossible to give sufficient ether to kill. Its only disadvantage is the necessity of intubation of the trachea, with possible danger of pneumonia from this source. The evidence which we have thus far tends to show that this danger has been much overestimated. In none of the cases in which the method has been applied to man has bronchitis or pneumonia occurred.

In so far as Quinby's experimental observations go, they entirely confirm the much greater experience of Meltzer, Carrel, and Elsberg, who find that the method of intratracheal insufflation is very safe, and rests on a firm physiological basis. In some thirty observations, some of them as long as four hours, others during such severe operations as total right pneumectomy and œsophageal sutures, Quinby has never had a death due to the method of anesthesia. The apparatus is about as easily carried as the usual Bennett inhaler kit, so that with it every surgeon has at his command an arrangement for making operative pneumothorax harmless. Of moderate price, easily transportable, and safe, it should make operations on the thorax common, and done by many surgeons, instead of, as today, by only a few. Further than this, it places at his command an apparatus which will "breathe for the patient" in case of respiratory failure from many causes other than acute pneumothorax. Already it has been used with success in cases of myasthenia gravis, severe opium poisoning, and cessation of respiration from brain abscess, as well as in the operative cases. It is Quinby's hope that many surgeons will familiarize themselves with the principle underlying this method, as it is one which will undoubtedly be of great value in the development of thoracic surgery.

THERAPEUTICS.

UNDER THE CHARGE OF

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The Use of a Salt-poor Diet.—Leva (*Med. Klinik*, 1910, vi, 782) gives a review of the literature dealing with the different indications for a salt-poor diet. He then discusses more particularly the practical application of such a diet and gives valuable tables showing the salt content of various articles of food based upon 360 analyses. There are included in his tables many foods poor in salt content that serve to make a liberal mixed diet in cases in which abstention from salt is indicated. These tables should be consulted for details, as only general statements are given here. Meat is the one article that seems to require considerable salt to render it palatable. In general, beef, veal, pork, and fish require more salt than poultry to render them palatable. Some of the meat foods contain a higher percentage of salt to start with. Butter sauces, and sauces with egg-yolk, oil, vinegar, lemon, etc., will take the place of salt if given with many of the meat foods. Eggs may be used to supply protein as they contain only a small percentage of salt. Soups and meat extracts require large amounts of salt to render them palatable. Vegetables are, as a rule, low in salt content with the exception of celery, carrots, savoy, spinach, cauliflower, and some varieties of winter cabbage. Bread should be made without salt and eaten with sweet butter. Some varieties of cheese contain a high percentage of salt, while

others are poor in salt. Most of the mineral table waters contain a large percentage of salt. Cocoa, milk, malt beverages, tonics, coffee, tea, etc., are low in their salt content. Cereals form an important part of the salt-poor diet as they contain only small amounts of salt. Cream and sugar can be freely used. Both fresh and cooked fruits may be taken in abundance. Canned goods should be excluded as they usually contain a considerable amount of salt. Leva says that horse-radish, mustard, and vinegar may be used to disguise the lack of salt in a salt-poor diet.

Alum Baths in Typhoid Fever.—Boggs (*Jour. Amer. Med. Assoc.*, 1910, liv, 2124) says that for two years alum baths have been used as a routine method of treatment in the wards of the Johns Hopkins Hospital, with a reduction of 50 per cent. in the incidence of such skin complications as boils, abscesses, dermatitis, bed sores, etc. The procedure is very simple and is carried out as follows: One pound (500 grams) of powdered alum is quickly dissolved in a little hot water and added to the tub during the filling. With the average tub of 450 to 500 liters, this makes approximately a 1 to 1000 solution. The cost is about 4 cents per bath. The patient is bathed in the alum solution just as in ordinary water and experiences no inconvenience from the presence of the drug. The only noteworthy changes in the skin are a slight increase in desquamation during convalescence and a decided diminution in the incidence of skin complications of all sorts. In these cases the care of the skin is the same in all except for the alum baths. It is not suggested that the alum baths can replace the rigid care of the skin in the ordinary way, but that with them the frequency of skin complications will be still further reduced.

Antityphoid Vaccination.—Hartsock (*Jour. Amer. Med. Assoc.* 1910, liv, 2123) believes that antityphoid vaccination by means of the injection of dead typhoid bacilli is now destined to be a practical measure of prophylaxis and of value in the handling of typhoid epidemics. He says that in promulgating this vaccination as a popular measure it is necessary to convince the patient as to its immediate benign effects. The layman must be assured that there will be no detention from business and that the injection is without harm. The military commander, in times of war, when troops are being mustered in, must be convinced that his forces will be ready for duty at any time. Hartsock reports a series of 1100 vaccinations that, according to him, give sufficient evidence to assure affirmatively both the above. He advises antityphoid vaccinations for the following classes: (1) All persons between the ages of fifteen and twenty-five. Osler states that the greatest susceptibility to typhoid is between these ages. (2) All persons exposed in time of an epidemic. (3) Nurses and physicians. (4) All persons in the military service, and more particularly in time of war, when troops are enrolled and concentrated in camps.

The Treatment of Amœbic Dysentery.—Axisa (*Therapie d. Gegenwart*, 1910, li, 263) says that the usual methods of treating amœbic dystentery are most unsatisfactory. Ipecac, which is considered a specific by many, has the marked disadvantage of causing vomiting, or

at least nausea. High irrigations are too painful to be of use in the acute cases, although valuable in the treatment of subacute and chronic cases. Axisa calls attention to a remedy introduced by Legrand under the name of kossam. This remedy has been used in a crude way by the natives of tropical countries as a cure for dysentery for some time. It may now be obtained in tabloid form. Axisa has used it and speaks very highly of its good effects. The most striking effect is in the rapidity with which the blood disappears from the stools. He ascribes a hemostatic action to the kossam, and has also used it with success in profuse hemorrhages in intestinal tuberculosis and bleeding hemorrhoids. In addition, this remedy also seems to exert a direct action upon the amœbæ. Of 37 stools that were examined, no amœbæ could be found after treatment lasting from eight to ten days. Kossam is not astringent, and as the blood disappears from the stools it is advisable to add intestinal astringents to the treatment. When the process becomes subacute, high irrigations with a 0.5 or 1 per cent. solution of tannin will hasten the cure. He gives the details of a number of cases treated by this method, and says that he has seen a number of cases completely cured in three weeks, a result that could only be obtained in from six to eight weeks by former methods of treatment. For the treatment of subacute and chronic dysentery he advises, in addition to kossam, high irrigations of either a 1 per cent. ichthyol solution or a 0.5 to 1 per cent. solution of tannin. He also advises an occasional purge of sodium sulphate, and finally, when amœbæ are no longer found, the administration of such astringents as bismuth or tannin until there is no longer any diarrhœa.

Vaccine Therapy in Tuberculosis.—KING (*New York Med. Jour.*, 1910, xcii, 164) says that for the present vaccine treatment in tuberculosis consists in, first, the treatment of the tuberculous infection itself by some one or more of the tuberculins; and second, the treatment of the secondary pyogenic infection by the specific bacterial product indicated by the character of the secondary infection. He believes that there is no especial advantage in the use of autogenous tuberculins. On the other hand, the comparative ease of preparation and standardization of autogenous bacterial vaccines to meet the requirements of the usual secondary infection, renders their use both practical and preferable. At the Loomis Sanitarium two classes of patients are advised to take tuberculin: (1) The class of incipient cases which have been under observation for a sufficiently long time to justify the belief that they are not progressive and are without fever or other evidences of a marked general toxemia. (2) The class of more advanced cases, presenting evidence of "arrested" activity, the patients having been for some time without material change in their condition, either local or constitutional, but who still have cough and tubercle bacilli in their sputum. King thinks that the choice of tuberculin is more a matter of arbitrary preference on the part of the physician than of advantage on the part of any particular tuberculin. He prefers bacillus-emulsion in most cases, though giving no reason for this choice. At the Loomis Sanitarium, as a routine practice, they begin with 0.00000001 gram (solid substance) of bacillus-emulsion and 0.0000001 c.c. of bouillon filtré, and proceed by 50 per cent. increases until 0.0001 gram, or 0.00001 gram in the case of bacillus-

emulsion, and sometimes larger doses in case of bouillon filtré are reached; afterward proceeding at the rate of 20 per cent. increases until the maximum dose or the termination of the course is reached. However, should intolerance for an increased dose develop at any time during the treatment, this plan of progression may be wholly changed. No attempt is made to attain a definite maximum dose. It is rare to exceed a maximum dose of 0.001 gram of bacillus-emulsion and 0.1 to 0.5 c.c. of bouillon filtré at the end of a course of from seven to nine months. King thinks it safer to give the tuberculin at intervals of one week, though it is no doubt safe to give the tuberculin twice a week during the earlier stages of the treatment. General reactions are to be avoided, but King thinks that local reaction may be actually advantageous in some cases. In young persons, when the superficial lymphatics are the only demonstrable foci of infection, a reaction characterized by some swelling and tenderness in the infected glands is almost always followed by a distinct improvement. This also seems to be the case in some laryngeal cases, though in those cases in which an old fibroid infiltration has already appreciably narrowed the glottis, a focal reaction may undoubtedly cause a sudden and very alarming stenosis. Such a lesion, according to King, contraindicates tuberculin treatment. King has also treated cavity cases with persistent high fever that does not yield to complete rest in bed with autogenous vaccines prepared from the patient's sputum. He gives the method of preparation of such a vaccine, and states that no untoward effects have occurred as a result of this treatment. He thinks that a relation can be traced between this treatment and a remission in the symptoms, chiefly in lowered temperature in the majority of cases so treated. However, the number of cases treated has been too few to admit of any positive statement as to the value or the practicability of this method of treating the complicating pyogenic infections in pulmonary tuberculosis.

The Tuberculin Treatment of Pulmonary Tuberculosis in Office and Dispensary Practice.—MILLER (*New York Med. Jour.*, 1910, xcii, 160) says that the present position of tuberculin therapy may be summarized as follows: (1) Tuberculin is a valuable addition to our means of treating pulmonary tuberculosis, its effects being best evidenced by a greater permanence of good results, a larger proportion of cases which lose bacilli from their sputum, and the relief from toxic symptoms, especially in chronic advanced cases. (2) Tuberculin can do no harm when given carefully in proper dosage. (3) No one of the ordinary preparations of tuberculin possesses any material advantage over the others. (4) The so-called clinical method is the most practicable guide for the administration of tuberculin in pulmonary tuberculosis, and the aim should be to produce no general reactions. (5) The time element in treatment is more important than the absolute dosage, the latter varying with every case and the former being never less than six and often more than eighteen months. (6) With unimportant modifications, this method of treatment is quite as applicable to dispensary and office patients as to those in sanitaria.

The Treatment of Gastric Subacidity with a Coarse Diet and Lemon Juice.—ROEMHELD (*Therapie d. Gegenwart*, 1910, li, 285) says that it is a well-known fact that coarse foods exert a greater stimulating action upon the gastric secretions than do foods that are finely divided. Thus it is customary to give patients with gastric hypersecretion food in the form of soups or purées in order to diminish the acidity. Roemheld has observed that in patients with a diminished acidity but with unimpaired motility it was possible to increase the acidity by giving coarse foods such as graham bread, fruit, cereals, salads, etc. This same effect was observed in cases of lowered acidity of nervous origin, and in gastritis with low acidity and an increase of the secretion of mucus. He believes that the coarse food excites mechanically the production of gastric juice, cleanses the mucus from the stomach, and counteracts constipation, which is so often associated with subacidity. Roemheld also believes that there are many patients who are not able to take hydrochloric acid. He advises giving such patients citric acid, especially in the form of lemon juice added to salads.

Observations Concerning the Action of Digitalis.—VON LEYDEN (*Therapie d. Gegenwart*, 1910, li, 482) deprecates the tendency to prescribe digitalis as soon as symptoms of cardiac incompetence occur. He says that tolerance soon follows the use of digitalis, and when more serious symptoms of cardiac failure develop, no results are obtained from its administration. Measures tending to secure both physical and mental rest for the patient should be employed before the use of digitalis. Von Leyden is of the opinion that digitalis has a greater action upon the left side of the heart, and so may fail to benefit those patients suffering more from a failure of the right heart. In fact, he believes that digitalis may even be harmful in these cases. He also thinks that, due to the action of digitalis principally upon the cardiac muscle, there will be little or no effect in advanced myocarditis or when valvular disease is associated with myocarditis. Von Leyden has not seen much benefit derived from the use of digitalis in fever; in fact, large doses seem to be actually harmful. He prefers the infusion of digitalis, and gives it in smaller doses than those usually prescribed, and discontinues it when its therapeutic effects have been obtained. He believes that digitalis in pill form is untrustworthy and that the tincture is uncertain. Digitalis leaves vary in strength according to where grown and the time of gathering. Age also diminishes their strength.

The New Treatment of Syphilis (Ehrlich-Hata).—ELSNER (*Jour. Amer. Med. Assoc.*, 1910, lv, 2052) says that his experience with this remedy as he saw it used abroad and in his private and hospital practice justifies the following conclusions: (1) The treponema, otherwise known as the Spirochæta pallida, is positively destroyed and the living contagion of syphilis is promptly removed by the Ehrlich-Hata remedy. (2) The preparation "606" promptly and favorably affects visible and palpable syphilitic lesions. It also removes deep-seated gummas. (3) The remedy stays the destructive and onward march of syphilitic ulcerations and causes their healing in a surprisingly short time. (4) It is more rapid in its effect on specific disease than any other known remedy.

(5) It is likely to prove more valuable than any other remedy in the treatment of the specific diseases of most internal organs. (6) It cannot replace cicatricial tissue; neither does it affect favorably chronic degenerative diseases of the nervous system, such as paresis, system diseases of the cord, in which there is a break in the continuity of nerve structure, though in some cases it seems to influence favorably the continuous crises of locomotor ataxia. (7) In all cases it causes a leukocytosis and the formation of antibodies. (8) It materially modifies, and in most cases ultimately negatives, the Wassermann reaction. (9) It unquestionably floods the circulation with endotoxins resulting from the death of millions of spirochetes, and in all probability an antitoxin is developed in the blood serum. These facts must be thoroughly considered in connection with the treatment. (10) In acute and threatening deposits in vital organs the effect of "606" will often prove life-saving, because of its prompt action, and for that reason it is preferable to the iodides of mercury. (11) It ought not to be given to ambulatory patients; neither is it safe n the hands of the careless or those who have not seen it used and learned the difficult method of its preparation for injection. (12) The hospital, where all things required in the preparation of the mixture of "606" can be sterilized, and where the centrifuge can be used, is preferable to any other place for its injection. (13) Patients injected should be kept quiet and in bed during seven days under close observation, and for a longer period if indications demand. (14) Second injections, if indicated, should not be given in less than eight weeks after the first. (15) Contraindications should be carefully considered before using the remedy. Patients with any other infection than that of syphilis should not be injected, however mild the former may be, until a safe period has elapsed after their recovery; neither should the feeble or old or those with any other syphilitic organic disease be injected. (16) Congenital syphilis can be cured by injecting the mother of the nursling with "606," without direct treatment of the child. Mierowsky and Hartmann have used the blood serum of injected mothers in the treatment of congenital syphilis with decided benefit. (17) The living contagion is destroyed by "606," hence its early cure can prevent the spread of syphilis. This subject demands the immediate attention of sanitarians and those directly interested in public health. (18) In occasional well-selected cases the use of the iodides after the method of Wechselmann will increase the efficacy of "606" when second injections are necessary. From two to three weeks should lapse after thorough mercurial treatment, when this has been used, before the injection of arsenobenzol. (19) In spite of the fact that nearly all agree that the effect of arsenobenzol is magical, sufficient time has not elapsed to justify the conclusion that a single injection of "606" will prevent what we now recognize as the secondary and tertiary stages of syphilis. Only after long years of careful observation shall we be able to reach a positive conclusion. It will be necessary, therefore, to keep injected patients under close observation.

PEDIATRICS.

UNDER THE CHARGE OF
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The Causes and Management of Eczema in Infants.—DR. GALEWSKY (*Medizinische Klinik*, 1910, vi, 1855) declares that eczema is the most important skin disease of infancy and constitutes half of all skin affections in that period. He notes the principal types, such as seborrhœa of the head, involving the entire face; large, sharply defined patches on the chest and back; small isolated seborrhœic patches, usually on the face; eczema intertrigo; damp, crusty eczema, with great skin thickening, in lymphatic infants; and the more disseminated, dry eczema in anemic infants. It was recognized long ago that excess of foodstuffs over the amounts necessary and assimilable was a factor in producing eczema. Bohn has laid especial stress on excess of fats in this connection. But the foundation for the production of eczema lies in a constitutional susceptibility or diathesis, called lymphatic constitution, lymphatic diathesis, exudative diathesis, etc., which is characterized by enlargements of the lymphatic system, pallor, catarrhal affections of the respiratory tract, and a great tendency toward skin affections. The majority of children of this type are eczematous, and a correction of their diet and an alteration of their diathesis by treatment is followed by improvement or disappearance of the eczema. Galewsky does not believe in a scrofula of infancy as such, but holds such conditions to be an exudative diathesis, which later in life furnishes the soil upon which tuberculosis develops. Errors in the chemical combination of food, hereditary disposition without diathesis, and uncleanliness are also predisposing factors. Eczema follows many other primary skin affections. Galewsky has never seen severe constitutional disorders follow sudden healing of an eczema, which, Henoch claims, does occur. Internal treatment relating to nutrition and food must be combined with external measures to secure good results. Apparently healed eczemas often leave unnoticed areas of skin thickening which cause a recurrence when nutrition is again disturbed. The infant's food must be reduced to just that amount which can be assimilated and which will maintain body weight. Regular feeding intervals, regular weighing on scales, and careful observation of the general development are very important. Especial stress is laid on reducing the fat percentage in the food to a minimum, and making three of the five daily feedings weaker in proportion than the other two. Eggs, cream, and butter should be entirely avoided. In older children vegetables should be substituted in the diet as early as possible. Fresh air, sunshine, and change of environment are often important factors. Overfeeding and an excess of fats are common faults in anemic infants, in whom regulation of the bowels is highly important. In some cases feeding with whey, as in Finkelstein's method, gives good results. Arsenic is of use in a small number of protracted cases only. In gastric disorders he mentions

intestinal antiseptics, such as ichthalbin, calomel, benzonaphthol, bicarbonate of soda, and magnesia. Local treatment consists of cleansing the skin with lotions not containing soap and in preventing scratching. Later, mild sulphur baths are recommended. He uses powder for moist eczema, or cloths damp with a resorcin solution. Dry eczema calls for soft ointments of diachylon, lead, zinc, bismuth, and salicylic acid. For eczema of the head he uses salicylic acid ointment, chamomile washes, and, later, tar ointment.

The Presence of Bacterium Coli on Out-of-door Objects, Especially on Food —Georg Neumann (*Deut. med. Woch.*, 1910, xxxvi, 2046) has proved the presence of Bacterium coli on the equipment of kitchens and outhouses which was constantly being touched and handled by human hands. He undertook a second investigation on foodstuffs and fruits. The Eijkmann method was used in both investigations. The Bacterium coli was found present and identified, in two out of five, on loaves of bread; once in eight times in wheat; eight times in eight different samples of milk; and two out of four times in butter—the specimen being taken from the centre of the mass. Fruits tested—apples, pears, plums, and grapes, bought from hucksters—all showed positive results, and Bacterium coli was identified in four tests on apples, and positive three times in four tests on pears and plums. The result was practically the same on fruits bought in market from farmers. Apples, pears, and plums which showed Bacterium coli were given to a maid to be washed under a spigot, and then the fruit was again tested. The two apples showed Bacterium coli after washing; of the two pears, one only was negative after washing, but both plums were negative after washing. This test was repeated, with practically the same result, on fruits from a different source. Bacterium coli was isolated and identified in all the positive tests. In tracing the method by which Bacterium coli reached the fruit, Neumann found the following facts: The ground underneath and near the trees bearing the fruit showed the presence of Bacterium coli in all of ten examinations, but as the fruit was practically all picked from the trees, and did not reach the ground, Neumann took cultures from fruit still on the trees, on a hot, dusty day, to test whether or not the dust conveyed Bacterium coli to the fruit. In the fifteen examinations thus made, including many cultures from fruit in several orchards, not one was found positive. This conclusively showed that the fruit was contaminated by the hands of the hucksters and dealers. Grapes seem the only exception, since four examinations on grapes bought from hucksters were negative, and five examinations of grapes still on the vine were also negative. The tests on drinking water were negative. Neumann points out the dangers of epidemics through the infection of the intestinal tract from fruits and also other food, grapes being apparently an exception. From his investigations he predicts it safe to eat fruit personally plucked from the trees. He claims that wherever the human hand is laid there Bacteria coli may be found.

Acute Laryngeal Dyspnœa in Children.—Harold Barwell (*Lancet*, 1910, clxxix, 447), in a clinical lecture under this heading, makes the following points: Laryngeal obstruction is more common in children

because the lumen of the glottis is absolutely and relatively smaller. The principal reason is the tendency to spasm of the glottis in the early years of life. Spasm is a most important factor in nearly all forms of laryngeal obstruction. In the diagnosis of laryngeal dyspnœa the following points are noted: Inspiratory stridor is marked, while expiration is easy. If the larynx is obstructed, that organ is forced downward distinctly with each inspiration, which effect does not occur in obstruction elsewhere. The head is thrown back to open the laryngeal region. The causes of laryngeal dyspnœa range from pure reflex spasm of the glottis to simple mechanical obstruction. Pure spasm is caused by reflex irritation, as in laryngismus stridulus, and is a combination of morbid excitability of the nervous system plus reflexes from the bowel, etc. In acute laryngeal affections the reflex irritation is due to catarrhal inflammation. In laryngeal diphtheria, primary deposits of membrane are very rare. Non-diphtheritic, membranous laryngitis in children, aged from two to eight years, is generally primary in the larynx and is accompanied by a loud ringing cough, followed by spasm, fever, and dyspnœa. This form is more dangerous than the diphtheritic, since the advent of antitoxin. Marked dyspnœa between exacerbations usually means œdema or diphtheritic membrane. Retropharyngeal abscess and foreign bodies also cause acute dyspnœa. The former is characterized by fever, rapid onset, severe dyspnœa, and dysphagia. Sudden dyspnœa is suggestive of a foreign body. In treating laryngismus stridulus the epiglottis should be hooked forward by the finger, the conjunctiva stimulated by the touch, and the nasal mucous membrane with a feather. Inhalations of amyl nitrite are of value. Prophylaxis includes regulation of the gastro-intestinal tract. Liquid extract of grindelia, 10 minims in milk every three hours, is of value. In diphtheritic forms tracheotomy or intubation should not be delayed. The tube should be taken out early—about the second or fourth day. Calomel and iron are of value. Non-diphtheritic forms should have the same treatment, as the diagnosis is often uncertain.

OBSTETRICS.

UNDER THE CHARGE OF

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The Induction of Labor.—LITTLE (*Jour. Obst. and Gyn. British Empire*, September, 1910) reports 46 inductions of labor in 3000 cases of pregnancy. The method employed was the introduction through a bivalve speculum of a medium sized rectal tube through the cervix by a flexible metal director. The average time from the introduction of the bougie to the onset of labor was six and one-half hours; the shortest time about half an hour; the longest about twenty-four hours. Twice the membranes ruptured prematurely, but at the onset of labor, and not

as a result of the introduction of the bougie. In 2 cases there was slight hemorrhage after the introduction of the bougie, but in no case was this alarming, as it was easily controlled. A general anesthetic was given in but 3 of the 46 cases. The indications were: Toxemia, 14; disproportion between head and pelvis, 8; protracted pregnancy, 8; tuberculosis, 3; pyelitis, 2; cardiac lesions, 2; fœtal death, 2; syphilis, 2; typhoid fever, 2; diabetes, 1; fever during labor, 1; and persistent vomiting, 1. In half the cases spontaneous labor occurred, and in the other half it was necessary to perform some obstetric operation to complete labor. These operations were all those of delivery through the vagina by various methods. Four of the mothers so treated died; in 1 case of persistent vomiting a small quantity of chloroform was given during delivery, and at autopsy extensive necrosis of the liver was found. A second case of severe toxemia had eclampsia after the bougie had been inserted and pains had started. The patient died on the third day, and autopsy showed thrombosis of the cerebral veins with necrosis in the uterine wall. One other patient died with marked œdema of the lungs, and one from general anasarca with chronic nephritis. Excluding those who had fever before the induction of labor—3 in number—in 43 cases there were 6 patients whose temperature rose above 100.6°. There were 19 fœtal deaths in the 46 cases; in the 8 cases of contracted pelves 2 children were born dead and 4 died at term; in 8 cases of protracted pregnancy 1 child died of intracranial hemorrhage. It is interesting to note that the induction of labor was performed for some conditions which are not accepted by all operators as valid indications. The experience of some indicate that syphilis and typhoid fever do not call for the induction of labor. In disproportion between mother and child the fœtal mortality was higher than that of elective Cesarean section. In protracted pregnancy the same was true. As has been repeatedly shown by others, disproportion between mother and child is not an indication for the induction of labor, if the life of the mother is to be considered of especial value. In heart lesions induction of labor was serviceable, while in tuberculosis the results for the mother were good; 2 cases of pyelitis recovered rapidly after the evacuation of the uterus, although the same result has been observed when labor was not induced; the case of diabetes recovered after the emptying of the uterus. In 54 cases the cervix was forcibly dilated, in 52 by the hand, after Harris' method, and in 2 cases by the Pomeroy bag. There were 5 deaths in this series, 3 from eclampsia, 1 from placenta prævia, and 1 after pubiotomy. In the last case dilatation was done preliminary to the pubiotomy upon a patient with marked contraction of the pelvic outlet. Dilatation was accomplished without injuring the cervix, but in performing version the arms went above the head, and in bringing them down the vagina and cervix were cut through by the passage of the arm over the sharp edge of the severed bone. The patient died of peritonitis. Of the 52 cases operated upon by Harris' method, lacerations of the cervix occurred in 71 per cent. In 30 of the 34 cervices so lacerated, sutures were taken at once; and in 85 per cent. immediate union followed; in 6 cases in which union did not occur the ultimate result was not worse than is often seen in spontaneous labor; in the 2 cases in which the Pomeroy bag was used the cervix was torn, but was immediately sutured; 2 of the patients in whom the

cervix was immediately closed had been delivered for the second time, and the course of labor was normal and lacerations of the cervix did not occur. In placenta prævia the danger seems to lie in thrombosis. A normal puerperal period was more frequent after the application of forceps than after version. So far as the child was concerned, when dilatation was performed rapidly, and the mother was in good condition, if the head was not securely engaged, version gave much the better result. In commenting upon the series, the author believes that the method used for the induction of labor has proved more satisfactory than any of the other means suggested for the purpose. Harris' method of dilatation is satisfactory when the application of the forceps must be preceded by the obliteration of the last rim of the cervix. Its dangers are obvious in cases in which the cervix is unusually vascular. The use of the dilating bag is limited to cases in which there is no objection to rupturing the membranes. The bag displaces the head, if already in the pelvis, and anyone who has tried to insert a bag into a cervix admitting but two or three fingers will appreciate the inadvisability of recommending its use in general practice. The necessity for emergency measures in obstetrics, the author thinks, varies inversely with the care given to the patient during pregnancy. Many complications of labor can be anticipated and avoided by the timely induction of labor. Pelvic contraction is not to be considered as an indication for the induction of labor. Prolongation of pregnancy, on the other hand, is more frequently an indication. The passage of the bougie and the introduction of the gauze pack will usually bring on pains within a few hours. Labor may be spontaneous or may be terminated artificially. When the cervical canal is obliterated, its dilatation by the hand is usually easy, and with care reasonably safe. Hemorrhage and infection can be avoided; lacerations of the cervix will frequently occur, and such lacerations should be immediately repaired. This method can be employed without assistance other than the anesthetizer and a trained nurse. It is simple, applicable to many cases; the force used is limited to the fingers of one hand, and the fingers can recognize and estimate the resistance to be overcome.

Ovarian Pregnancy with Diffuse Intraperitoneal Hemorrhage.—LEA (*Brit. Med. Jour.*, October 22, 1910) reports the case of a patient, aged twenty-nine years, married two years. She was suddenly seized with intense abdominal pain, vomiting, and faintness. When seen the pulse was barely perceptible, the abdomen distended below the umbilicus, and very sensitive. Tenderness was more marked in the left iliac region. There was dulness in the flanks and a suggestion of fluid in the abdomen. Menstruation had occurred normally three weeks previously, and there was no hemorrhage from the uterus. On vaginal examination, there was distinct fulness with slight resistance in Douglas' pouch, but no obvious swelling of the appendages could be recognized. On opening the abdomen a large quantity of blood and clots was found free in the peritoneal cavity. The left ovary was enlarged and from its surface projected a thin-walled blood cyst which had ruptured. The right tube was healthy. The blood and clots were removed as completely as possible and the abdomen closed without drainage. With saline transfusion the patient recovered. On examination, a portion of the ovarian cortex was found to have expanded to form the wall of the cyst, and

was continuous with a mass, which, microscopically, showed contained chorionic villi. Sections of the ovary revealed great dilatation of the bloodvessels with areas of hemorrhage, and in one portion a thick layer of lutein cells. Pregnancy probably occurred in a Graafian follicle, the ovarian tissue becoming thinned, forming a capsule for the cyst, and hemorrhage occurred after rupture.

The Origin and Prevention of Puerperal Fever.—At the last meeting of the British Medical Association, DÖDERLEIN (*Brit. Med. Jour.*, October 22, 1910) drew attention to the danger of infection from within the female generative organs themselves, and also the danger of inoculation by pathogenic organisms from without, during labor or the puerperal period. To determine the value of preliminary disinfection of the vagina during pregnancy, Döderlein calls attention to the results obtained in the Tübingen clinic, in which 500 parturient women were treated by irrigation with one quart of solution of sublimate 1 to 1000. During the irrigation the walls of the vagina were rubbed with two fingers of the gloved hand carefully and cautiously, but as thoroughly as possible. All internal examinations were made exclusively with the gloved hand, and the external genitalia were previously disinfected, so that the introduction of microbes from without was excluded. In the same period there were 500 lying-in women who were not subjected to vaginal disinfection. Of the 500 disinfected patients, 12.8 per cent. had fever, while of the 500 not disinfected, 8 per cent. had fever. After deducting those who had fever not originating from the genital organs, there remained 5.2 per cent. with fever among the non-disinfected and 10 per cent. among the disinfected. In the Munich clinic, irrigation was made with from ½ to 1 per cent. solution of lactic acid. The result showed that in 480 parturient women disinfected by this method, 6.29 per cent. had fever, while in 477 not irrigated, only 3.3 per cent. had fever. Similar results in the hands of other observers emphasized the fact that preliminary disinfection during pregnancy should not be practiced in normal parturient women. Döderlein calls attention to a glove which he has devised for use by students and midwives, which facilitates the use of gloves and prevents infection. The glove has but two fingers, the remainder protecting the hands by a mitten. These gloves are cheaper than the usual sort, are disinfected at the factory by steaming, and then packed in a triple cover, impervious to air and bacteria.

The Treatment of Rupture of the Uterus.—MUNRO KERR (*Brit. Med. Jour.*, October 22, 1910) adds 3 additional cases to his previous report of 14. Of the last 3, 2 were treated by hysterectomy and drainage, and 1 was treated—as the tear was incomplete—by gauze packing through the vagina. This patient died five hours afterward. Kerr has performed hysterectomy 11 times, with 5 recoveries. Out of 6 fatal cases, 4 died from sepsis and 2 from shock. He believes that sepsis is the cause of death in these cases, and in his later experience he has completely removed the uterus and drained the lacerated broad ligament by a thick rubber tube brought out through the vagina and loosely surrounded with gauze. The lower part of the pelvis is completely covered with peritoneum. The drain is left three or four days, and the results have been satisfactory.

GYNECOLOGY.

UNDER THE CHARGE OF
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The Present Status of the Colon Tube.—By means of skiagrams, YATES (*Amer. Jour. Obst.*, 1910, lxii, 761) has demonstrated that seldom, if ever, are soft rubber tubes admitted into the normal colon. When an endeavor is made to force the tube upward, even by the gentlest manipulations, it is found to coil itself up in the rectum and there do positive harm because of pressure, irritation, and the consequent inability to retain the enema. In perhaps half the instances it is impossible to tell when the tube is coiling upon itself, even when we suspect it. Colon tubes as such are of no value, because they do not reach the colon, and they are mischievous in that proportion as we endeavor to force them higher up. Water or fluid injected 4 or 5 inches into the rectum is carried upward into the colon, and may be found at the cecum in ten minutes. There is good reason to believe that a reversed peristalsis is set up when fluids are injected into the rectum. The introduction of a tube more than 5 inches for colonic irrigation or other purposes is useless, and likely to defeat the object desired.

Lymphangiectases in Myoma Uteri.—TODYO (*Archiv f. Gynäkologie*, 1910, xci, 641) has made a study of three cases of myoma uteri, associated with marked dilatation of the lymph vessels in the broad ligaments. He was unable to distinguish any evidences of newly formed vessels, and is of the opinion, therefore, that these dilatations are true lymphangiectases rather than lymphangiomas. The production of these dilatations could not be explained on the ground of stasis resulting from occlusion of the efferent lymph vessels by thrombosis, inflammatory alterations, or pressure from without. He could demonstrate no impairment of the vessel walls which would permit of their primary dilatation, and does not accept the theory that an undue supply of lymph leads to their distention. Since his examinations failed to reveal a mechanical cause for its production, he advances the idea that the lymphangiectasis is due to changes in the vessel walls resulting from altered metabolism or intoxication associated with myomas, comparable to those changes observed in the heart and bloodvessels.

The Function of the Corpus Luteum.—From an exhaustive experimental research, FRAENKEL (*Archiv f. Gynäkologie*, 1910, xci, 705) substantiates the theory which he advanced seven years ago, that the corpus luteum is a gland with an internal secretion which brings about the alterations essential to the embedding and early development of the fecundated ovum. Further, the corpus luteum is responsible for the cyclic engorgement preceding menstruation. Examination of the ovaries during the course of operation shows that the follicle ruptures about nineteen days after the beginning of the last menstruation;

about eight days later the yellow body has reached the height of its development, the onset of the new menstruation marks the beginning of its involution, and by the end of menstruation it has disappeared. The administration of corpus luteum extract as a therapeutic measure was of no avail in dysmennorhœa, irregular periods, and the intoxications of pregnancy; he has had good results, however, from its use in those cases presenting symptoms of vasomotor origin, due to absent or diminished ovarian function. The article embraces an excellent summary of the recent contributions to this subject.

Chronic Intestinal Stasis.—LANE (*Surg., Gyn., and Obstet.*, 1910, xi, 495) defines intestinal stasis as a delay of the contents of the intestine in some portion of the gastro-intestinal tract, but more particularly in the large bowel, which allows of the absorption into the circulation of a larger quantity of toxic material than can be dealt with effectually. This delay is of mechanical origin, due to alterations resulting from pressure, strain, and the development of accessory peritoneal bands, evolutionary in nature, incident to the erect posture. These bands, while, on the whole, beneficial, may become vicious in their action by producing angulations and kinks. Abnormal fixation or kinking of the pylorus may result from bands extending to the liver or transverse colon; deformity of the ileum may result from the contraction of a band which develops on the under surface of the mesentery of the terminal portion of the small intestine. Strong bands of peritoneum are found between the cecum, ascending colon, and adjacent abdominal wall; also at the hepatic and splenic flexures, the angulations thus produced being exaggerated by the weight of the transverse colon. Bands are commonly observed on the outer surface of the mesosigmoid, converting the sigmoid into a straight fixed tube of diminished calibre and atrophic walls because of this fixation. The rectum may be enormously elongated and loosely attached, causing obstinate constipation. Intestinal stasis permits the ascent of deleterious organisms in the small intestine, with occasional infection of the biliary and pancreatic ducts. Constipation is due, chiefly, to a stasis in the large bowel; there may be evidences of a very marked auto-intoxication in cases in which there is a daily evacuation. The symptoms of auto-intoxication are loss of fat, cold, clammy extremities, inhibition of respiratory function, pigmentation of the skin, pain and weakness in the muscles, especially in the legs, arms, and back, and headache. The breasts undergo very definite changes; the upper and outer zone of the left breast becomes hard and nodular, and later the process is manifest in the corresponding zone of the right breast. The process gradually extends to the whole gland in which cysts develop. In the author's experience, brilliant results have attended ileosigmoidostomy or excision of the colon.

The Treatment of Tubal Pregnancy during the Early Months.—FEHLING (*Archiv f. Gyn.*, 1910, xcii, 3) advocates immediate operation in all cases of tubal rupture, as well as hematocele, and condemns postponement in the hope of reaction from collapse. The operation should be performed in a hospital, since the poor facilities of a private house promote delay, and the chances of infection are greater. The abdominal route is preferred in all cases because it affords a better view of the

field of operation, permitting greater rapidity combined with a better opportunity for the examination of the opposite side, which he regards as of great importance. The mere evacuation of a hematocele by the vaginal route is not sufficient, since the diseased tube is left behind to cause further trouble; infection is more likely to occur and convalescence is delayed. Only in the presence of suppuration of the hematocele, or when the test puncture demonstrates organisms, does he resort to evacuation by the vaginal route. Following these radical principles, 170 cases have been operated upon in the Strassburg clinic during the last nine years. Of this number, there were 43 ruptures with free hemorrhage, 3 ruptures with hematocele, 7 ruptures with sacculation of the bleeding, and 93 tubal abortions with hematocele. The remaining 24 cases were made up of simple unruptured pregnancy, tubal abortion without hematocele, etc.; 64 per cent. of the ruptures were found in the isthmus or interstitial (3 cases) portion of the tube; 86.8 per cent. of the tubal abortions resulted from pregnancy in the ampulla. Rupture occurred in 78.5 per cent. of the cases of pregnancies located in the isthmus and 21.4 per cent. of those in the ampulla. All cases of tubal abortion were successfully operated upon; 7 deaths followed operation in tubal rupture. Of the 170 cases, only 22 were nullipara; in 143 cases, 52 per cent. presented disease of the opposite tube or ovary. Fehling believes that in the majority of cases a bilateral tubal disease is the underlying factor in the development of extra-uterine pregnancy. The condition is relatively rare in the better class of women. The rupture is undoubtedly due to alterations produced in the tubal wall by the growing villi; why extensive hemorrhage should occur from such a small opening is more difficult to explain, and he conceives the idea that some substances are liberated at the time of rupture which retard coagulation. An accurate diagnosis can be made in 95 per cent. of the cases; while the onset may be sudden and violent, the history is usually that of a beginning and delayed abortion; the demonstration of a mass behind or to the side of the uterus makes the case clear. Pyosalpinx may simulate tubal pregnancy so closely as to make the diagnosis impossible.

Adenocarcinoma of the Kidney.—SHERRILL (*Amer. Jour. Obstet.*, 1910, lxii, 997) details the histories of 7 cases collected from the literature and reports a case of adenocarcinoma of the kidney which he has successfully operated upon. Primary malignant disease of the kidney is usually unilateral. It may spread by direct invasion of the venous channels. by extension into contiguous tissue, by transplantation metastases into the bladder, and by the lymphatics. Lymphatic metastases occur late in the disease and are comparatively rare. Renal carcinoma appears most frequently between the ages of forty to sixty, although it may occur much earlier, even in fœtal life. It is probable that a large proportion of these tumors are of congenital origin, developing from cell rests. While a calculus may favor the development of the growth, it cannot be considered as a direct cause. Hematuria, pain, or the presence of a tumor will direct attention to the kidney. While the prognosis is always grave, radical removal in its early stages will offer about as large a percentage of recoveries as carcinoma in any other portion of the body.

OTOLOGY.

UNDER THE CHARGE OF

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The Otitis of Ozena.—LANNOIS and JACOD (*Annales des maladies de l'oreille*, October, 1910) direct attention to the frequencies of middle-ear disease as a complication, or sequence, of atrophic rhinitis and to the similarity of the evidences of the affection in the cases of suppurative middle-ear disease. With reference to the frequence of the aural sequence authorities differ, more recent observers contributing the larger percentages—Michel in 1876, Loewenberg in 1885, and Jurasz in 1891, reporting but few cases; the latter writer finding but 12 cases of aural complication in 170 cases of ozena. Zaufall, on the other hand, estimates the aural sequence of atrophic rhinitis at 80 per cent., and Morf at 47.5 per cent., including aural lesions of various forms. The investigations of the authors substantiate the estimates of Morf, and they have moreover determined a delimitable form of suppurative middle-ear affection occurring during the course of the atrophic rhinitis as a subacute or chronic evolution, its special clinical aspect being presented in the moderate suppurative discharge and the tendency to the formation of brownish or greenish crusts, having the odor distinctive of ozena, and justifying the recognition of the condition, not as a complication but as a true manifestation of the implication of the tympanic mucosa in the corresponding intranasal process, and the differentiative title of ozenous otitis. In the cases of prolonged middle-ear suppuration, with recurrent subacute attacks, there is but little in the objective manifestation or in the way of discomfort to the patient, beyond the impairment of hearing, to direct attention to the aural condition, but there is the peculiar ozenic odor of the purulent aural discharge, and objective examination reveals the resemblances, in the ear, to the condition in the nose, in the moderate amount of purulent discharge, and the firm, adherent, malodorous crusts which often resist removal without preliminary softening. The cases reported support in their history the contention of Lannois and Jacod that they present a distinctive class, the recognition of which is a matter of clinical importance. The local, aural treatment employed is that applicable in nasal ozena, the use of mild mentholated ointment and of hydrogen dioxide, for the softening and removal of the crusts, and the subsequent application of the essential oil of birch, the antiseptic quality of which resembles that of the oil of cade, the medium of application being vaseline, with an admixture of from 15 per cent. to 20 per cent. of the oil of birch.

The Subperiosteal Abscess of the Mastoid Region.—HOLGER MYGIND (*Archiv f. Ohrenheilk.*, 1910, lxxxii, Heft 3, 4) reports 100 observed cases of subperiosteal abscess of the mastoid region, all of which were secondary to suppurative middle-ear disease, there being no case of the

so-called primary subperiosteal abscess. The cases were nearly evenly divided between the two ears and the two sexes, but showed a preponderating frequency in infants and in young children; 15 cases, 12 male and 3 female, were under three years of age; 32 cases, 12 male and 20 female, were between one and four years of age; and 38 cases, 15 male and 23 female, were between the ages of five and fifteen years. The oldest patient was forty-three years of age. As the etiology and pathogenesis of the subperiosteal abscess of the temporal bone is but little mentioned in the literature of the subject, and as this includes matter of much practical importance, a large part of Mygind's paper is devoted to its consideration. In the majority of cases the suppurative tympanic process, which was the origin of the abscess formation, was of the acute type (78 per cent), 4 cases were of specific origin, 2 originated in scarlatina and 1 in typhoid fever; had the observation included material from contagious wards, the result would have been different, with a preponderating proportion undoubtedly of the cases due to scarlatina; in 3 cases tuberculosis was the primary cause of the preliminary suppurative middle-ear disease. In reference to the lapse of time between the inception of the acute middle-ear suppuration and the sequence of the abscess formation, the records showed that, in 25 cases, this sequence was evidenced within one week, and in an equal number of cases, not until after the lapse of a month, the great majority of the former cases being infants under one year of age. The bacteriological examination of the abscess contents, where this could be made from the pus unmixed with blood, gave streptococcus in the preponderating number of cases (21), and staphylococcus next (8), while in 8 cases in which the pus examined had been admixed with blood from the divided soft tissues, the result was negative; these statistics favored the contention that a staphylococcic angina was commonly the first link in the infective chain. Retention of pus in the tympanic cavity was found to be an etiological factor of importance in reference to the occurrence of the subperiosteal abscess, and, in 15 cases cited, there was no evidence of pus in the external canal and no perforation of the drumhead, while in still other cases the suppurative outflow was small in quantity because of a small perforation of the drumhead or the narrowing of a formerly sufficient outlet by a nipple formation. In 23 cases of a moderate degree of secretion from the middle ear, the pus was malodorous, and this in the acute manifestation, and accompanied by œdema of the posterior, superior, canal wall. In the cases of chronic suppuration the condition of the drumhead made this structure less of an etiological factor in relation to middle-ear retention; but in 16 out of the 22 chronic cases there was cholesteatomatous accumulation in both the middle ear and mastoid, constituting an important factor in the production of the subperiosteal abscess and in the osteitis of the mastoid with extensive and rapid destruction of the bone. In reference to treatment, Mygind's opinion is decided as to the inefficiency of the simple opening of the abscess, by means, for instance, of the familiar Wildes incision, since in all of the reported cases there was not only extensive osteitis, with considerable areas of necrosis, but in many of them those intracranial complications which make for the great fatality of these rapidly progressive cases, even when they come early under treatment, and the proper measure of resection of the mastoid process is applied. In the

majority of the chronic suppurations the bone conditions demanded exenteration, but in very young children the simple mastoid operation sufficed; in these latter cases Mygind re-curetted the granulomatous cavity within a fortnight after operation, allowing the cavity to fill with blood, and closing the opening over the blood clot by means of a secondary suture, the result being, in the majority of cases, effective with a considerable shortening of the after-treatment; when the secondary suture failed, the after-treatment was usually prolonged, averaging from two to three months, both because of the extent of the surgical cavity and the frequent occurrence of intracranial complications. The conclusions of Mygind from a careful and thorough study of his material, are to the following effect: (1) The subperiosteal abscess of the mastoid region is a common otogenous complication occurring especially in infants. (2) The primary middle-ear suppuration is usually of the acute type and the abscess develops, especially in very young children, at an early stage of the middle-ear suppuration. (3) The abscess occurs, almost invariably, as the sequence of an osteitis of the mastoid process; this osteitis is, as a rule, an acute process even when there is an already existant chronic osteitis. (4) When a chronic osteitis of the mastoid exists, it is commonly associated with cholesteatomatous conditions. (5) The osteitis of the mastoid process preliminary to the subperiosteal abscess is usually extensive and frequently accompanied by intracranial complications, implications of the sinus and of its vicinity preponderating. (6) The application of the Wildes incision in these cases is to be strongly discountenanced. The only adequate treatment consists in a mastoidectomy or in a tympanomastoid exenteration.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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The Pathology of the Conducting System of the Heart.—Low (*Ziegler's Beiträge*, 1910, xlix, 1) has studied the bundle of His and node of Tawara in a large series of hearts at autopsy, with the idea of investigating the frequency with which various common pathological conditions may affect this particular portion of the heart muscle, and whether sudden death in various cardiac diseases might be dependent upon such alterations of the bundle. A total number of 72 hearts were examined, from various acute infectious diseases, nephritis, emphysema, acute ulcerative endocarditis, chronic endocarditis, and myocarditis. In 52 of these cases distinct lesions were found in the bundle; usually the lesion was an acute one, consisting in infiltrations of cells, small abscesses, etc. Occasionally hemorrhages were found, or diseases of the blood-vessels. In a case of acute myelogenic leukemia, a small leukemic infiltration was seen in the bundle. In general, the results accord with

the findings of Monckeberg (Untersuchungen uber das Otrio-ventrikular bundel in menschlichen Herzen, 1909), who has studied in a similar manner 70 hearts. In accord with the observations of Monckeberg is the observation that the His bundle does not hypertrophy with hypertrophy of the remainder of the heart muscle. The demonstration that acute lesions are of common occurrence postmortem indicates that terminal alterations in the conducting system of the heart may occasionally be responsible for death in certain instances. With careful study by the phlebogram and electrocardiogram some of these cases may be recognized before death.

Subcutaneous Reaction of Rabbit and Horse Serum.—KNOX and MOSS (*Jour. Exper. Med.*, 1910, xii, 562) have found that anaphylaxis or allergy of rabbits against horse serum can be proved by the subcutaneous test. This is made by the injection of small amounts of horse serum beneath the shaved skin of the abdomen of sensitized rabbits. The specific reaction appears in from twelve to twenty-four hours after the test is made, and reaches its maximum in from twenty-four to thirty-six hours. It consists of a local swelling extending from 0.5 to 2 cm. from the point of inoculation. The skin involved in the raised area is usually red, and hotter than the surrounding skin. The hypersusceptibility sets in usually in from ten to fifteen days after the first injection of horse serum and lasts at least three months, though individual rabbits showed variations from the average time. Almost synchronously with the allergic conditions, precipitins against horse serum appear in the rabbit's blood. No suppression of allergy which would correspond to the so-called antianaphylaxis could be proved, and after large injections of serum the allergic rabbits still reacted subcutaneously. The allergic condition was not transmitted to the young, for the offspring of injected rabbits did not give a positive subcutaneous test. Neither the injection of large amounts of horse serum nor the marked local reaction of the skin produced any variation in the leukocytes greater than may be observed in normal rabbits.

Acute Degeneration of the Liver in Animals with an Eck Fistula Complicated with Pancreas Necrosis.—During some experiments with an Eck fistula in dogs, FISHLER (*Deut. Arch. f. klin. Med.*, 1910, c, 329) found that if the pancreas was injured a train of well defined symptoms developed, ending in death. These symptoms consisted principally in coma, with sensory and motor excitability. At autopsy the most striking pathological changes were extensive central necrosis of the liver, with a few fat necroses about the pancreas. Neither the symptoms nor anatomical changes can be brought about by Eck fistulas alone. On the other hand, extensive injury to the pancreas results in slight changes in the liver, perhaps similar in kind, but not to be compared in extent with those following the combination of an Eck fistula and injury to the pancreas. These liver changes have been noted frequently in pancreas necrosis, and Fischler believes them to be of much importance and caused by the action of the pancreas ferments upon the liver cells. When the blood supply of the liver is interfered with by shunting off the portal circulation into the vena cava, the function of the liver is disturbed and the action of even small amounts of pancreatic ferments is

greatly exaggerated, resulting in the extensive destruction of the lobules, accompanied by coma and death. The clinical feature is not unlike that seen in acute yellow atrophy. Fischler likewise believes that these experiments point to the fact that under normal circumstances the liver possesses an hitherto unrecognized function of destroying ferments. When this power is disturbed the ferments, for instance, of the pancreas, are not dispensed with, and therefore exert their toxic action upon the body. He offers this as an explanation for the death which occurs in extensive pancreatic necrosis.

The Pressor Substance of the Kidneys.—In an earlier communication BINGEL and STRAUSS (*Deut. Arch. f. klin. Med.*, 1909, xcvi, 476) found that it was possible to extract from normal kidneys of various animals a substance which was capable of producing a marked and fairly prolonged rise in blood pressure when injected into rabbits and dogs. This substance had been studied further by BINGEL and CLAUS (*Deut. Arch. f. klin. Med.*, 1910, c, 412). They find that this rise of blood pressure is probably brought about by a contraction of the peripheral vessels. Intravenous injections of rennin preparations were made in rabbits with oncometers placed upon the kidney and extremity. The injection of rennin was accompanied by a marked increase in the volume of the kidney, accompanied by diuresis and constriction of the vessels of the legs, which went hand in hand with the rise of blood pressure. This result is entirely different from that following the injection of adrenalin, which causes a great decrease in the volume of the kidney, an immediate decrease in the volume of the extremity, followed by an increase in the volume caused probably through the fact that blood is forced into the contracted vessels of the limbs through the high blood pressure. Finally, the limb decreases in volume again and the vessels remain contracted for some period of time. The action of rennin was then tried upon animals with experimentally induced nephritis. Sublimate was used for this purpose. Both the kidney volume and blood pressure of these nephritic animals reacted in exactly the same way as they did in normal animals. Finally, an extract of kidney from rabbits suffering from sublimate nephritis was compared with rennin from normal rabbits' kidneys. The extract of these kidneys, which were the seat of sublimate nephritis, gave rise to an entirely different reaction in the normal rabbit. Injections of the pressed juice of the kidney caused little or no effect upon the blood pressure and produced a marked decrease in the kidney volume. Since control experiments showed that this was not due to the presence of sublimate in the kidneys, the authors conclude that in sublimate nephritis the kidneys contain some substance which alters profoundly the normal action of kidney extract.

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